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DEPARTMENT OF THE ARMY FIELD MANUAL

NONDIVISIONAL ENGINEER COMBAT UNITS

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MARCH 1961

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FIELD MANUAL
No. 5-142

HEADQUARTERS,
DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., *20 March 1961*

NONDIVISIONAL ENGINEER COMBAT UNITS

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CHAPTER 1
INTRODUCTION

1. Purpose

This manual provides information and guidance in the employment and operations of nondivisional engineer combat units. Users of this manual are encouraged to submit recommended changes or comments to improve the manual. Comments should be keyed to the specific page, paragraph, and line of the text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded direct to U.S. Army Engineer School.

2. Scope

The manual outlines the mission, organization, equipment, capabilities, operations, employment, and training of nondivisional engineer combat units, including the engineer combat group, the engineer combat battalion, the float bridge company, the enginer panel bridge company, and the engineer light equipment company. Information is also included on the engineer brigade, the airborne light equipment company, and the engineer dump truck company. The material contained herein is applicable, without modification, to both nuclear and nonnuclear warfare.

3. Mission

The mission of nondivisional engineer combat units is to perform large-scale coordinated combat engineer operations for corps or army within a specified area or field of responsibility (fig. 1).

4. Definition

a. The term nondivisional engineer combat units is applied to engineer units which are not organic to divisions but which work closely with them in support of combat operations. Unlike the divisional engineer units, which are combat units organized, trained, and equipped for multipurpose tasks, capable of providing engineer support to their own division under normal conditions, the nondivisional engineer combat units are designed to perform engineer tasks within an assigned area of responsibility or to support divisional engineer units by accomplishing tasks which exceed, either by number or by nature, the capabilities of the organic division engineer battalion.

b. Combat engineer operations are those engineer activities which are a part of the army's combat effort. They have two

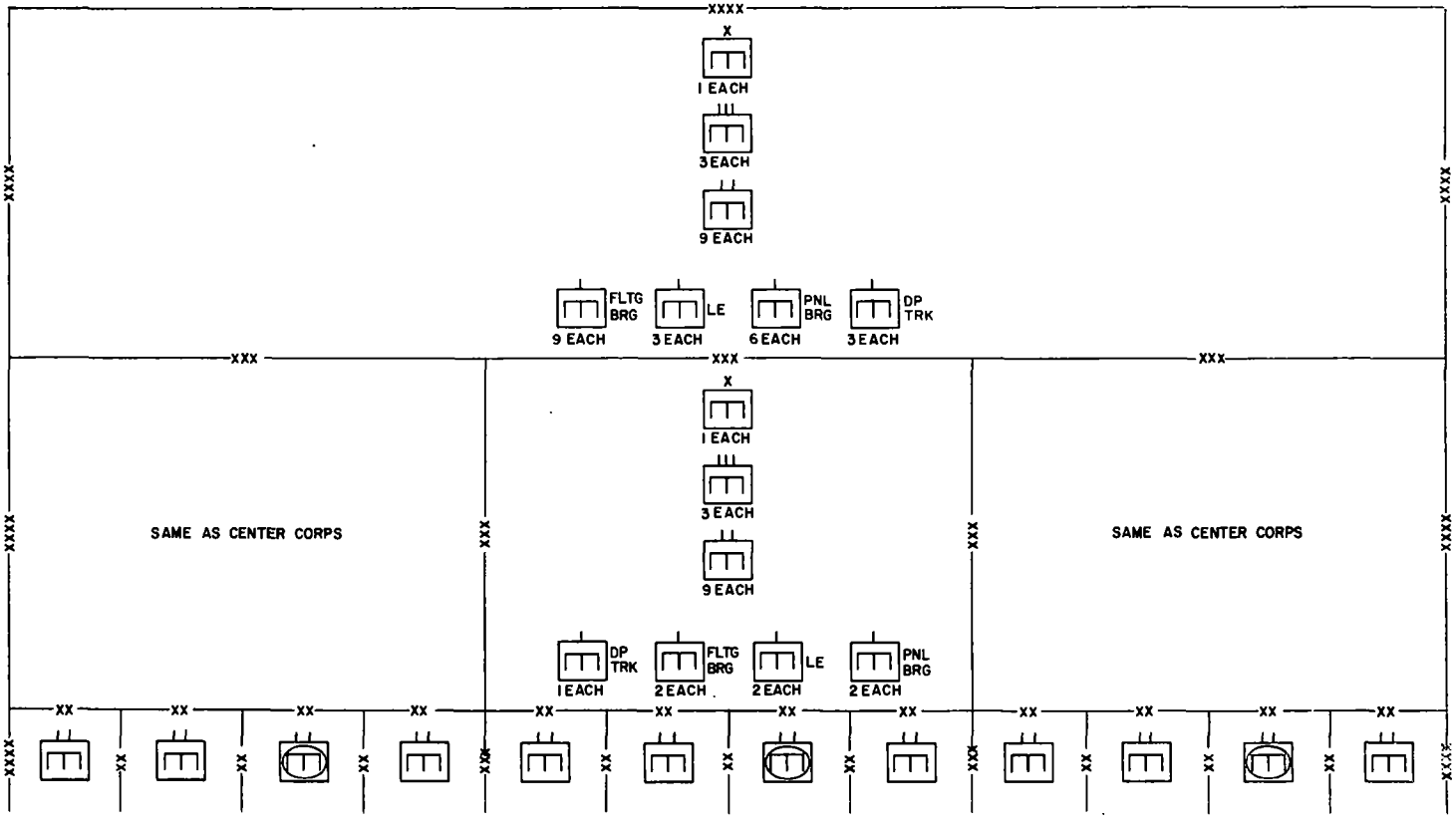


Figure 1. Engineer combat units in the type field army.

basic purposes: to support and increase the effectiveness of friendly forces and to impede, block, or canalize the maneuver of enemy forces. Engineer combat units accomplish their basic missions by construction and destruction activities. Combat engineering includes construction and maintenance of routes of communication in the combat zone; construction of field fortifications, barriers, and obstacles; and destruction of installations and line of communication (LOC) facilities to hinder the mobility of the enemy. Combat engineering, in the broadest sense, includes some pioneering tasks which may be accomplished by all arms and services. However, every effort should be made to avoid dissipation of the engineer potential on tasks of this nature. Combat engineer operations that involve the employment of trained engineer troop units and engineer equipment on tasks requiring special engineering skills, equipment, and coordination contribute most of the effectiveness of the supported force.

CHAPTER 2

ENGINEER BRIGADE

5. Function

The largest engineer combat troop command is the engineer brigade. The brigade is utilized when the control of a large-scale engineer operation demands a single engineer command. The brigade headquarters is organized to command and coordinate construction and engineer combat units. In this chapter, only the brigade coordinating engineer combat units will be discussed.

6. Composition

The engineer brigade is a flexible organization which consists of a regularly organized headquarters and headquarters company to which other engineer units are assigned or attached, the principal units being usually two or more engineer combat groups. Other categories of engineer units may be added including topographic and camouflage.

7. Mission

The mission of the engineer brigade is to perform operational planning and command and staff supervision, and to coordinate activities of engineer groups and other assigned or attached engineer units for large-scale operations in the combat zone.

8. Major Items of Equipment

The major items of equipment of the engineer brigade are listed in the applicable TOE's of the units assigned or attached to the brigade.

9. Mobility

a. Headquarters and headquarters company, brigade, is 100 percent mobile.

b. Headquarters and headquarters company, engineer combat group, and units assigned or attached to the groups are 100 percent mobile.

c. Mobility of other units assigned or attached to brigades is as stated in the applicable TOE's.

10. Assignment

In the field army, the brigade is assigned to army.

11. Capabilities

a. The Brigade. Its capabilities depend on the number and type of its component units.

b. Brigade Headquarters. It is trained and equipped to:

(1) Command and supervise assigned or attached units.

(2) Review brigade supply requirements and supervise the procurement and allocation of equipment and materials.

(3) Supervise subordinate unit's administration, including mess, supply, personnel requirements, allocation of replacements, promotions, awards and decorations, and the administration of military justice and the safety program. Brigade furnishes direct administrative assistance to its separate companies or detachments which are not attached to groups.

(4) Prepare operational plans and orders; allocate troops, materials, and equipment to tasks; and undertake the direction and the technical and tactical supervision of units engaged in combat engineer missions.

(5) Serve as an engineer control headquarters for a separate task force for a major combat mission with a minimum addition of personnel.

(6) Supervise the maintenance activities of subordinate units.

c. Company Headquarters. It commands and supervises assigned enlisted personnel and provides the support for the company brigade headquarters elements, to include mess, supply, organizational maintenance, communication, and company administration.

12. Employment

The vastly increased areas involved in modern tactical operations require increased engineer effort. This effort is more flexible than in the past, and it is immediately responsive to the combat support requirements of dispersed and rapidly moving tactical elements. An engineer brigade operating in each corps and one operating in army provide the command and communication necessary for this highly critical support. Elements of the corps engineer brigade operate from the corps rear boundary forward into the divisional areas, primarily on an area assignment basis. The army engineer brigade provides general combat engineer support to the field army. Elements of the army brigade operate from the army rear boundary forward into the corps area on both an area and task assignment basis. An engineer brigade headquarters may also be attached to, or form the nucleus of, a special task force.

13. Command and Staff

a. Brigade Commander. In the corps area, the brigade commander controls and coordinates all engineer nondivisional com-

bat and combat support activities. He shifts the engineer effort as necessary to meet requirements. Elements of the brigade operating forward into divisional areas coordinate their activities with the division engineer through their combat group headquarters. In the army area, the brigade commander commands or coordinates all engineer combat and combat support activities. He coordinates these activities with the army engineer and with the commander of communications zone engineers employed in the army area. Coordination with corps is effected through the corps engineer brigade commander. If the use of nuclear weapons is contemplated, the brigade commander:

(1) Participates in preliminary conferences in which ways and means are determined to carry out the commander's plan. Targets and delivery means are discussed by all interested members of the staff; and the engineer may be called upon to present reasons for retention or elimination of specific targets. The engineer is particularly concerned with the effects of nuclear attack on terrain (obstacles caused by cratering, tree blowdown, or radiological contamination) and the influence of these effects on the overall plan and engineering requirements (FM 30–10). He may be detailed to assist in analyses of proposed targets; and he may analyze the use of atomic demolition munitions and make recommendations on the following:

(*a*) Quantity, type, and yield of weapons.
(*b*) Height or depth of burst.
(*c*) Desired emplacement site location.
(*d*) On-call detonation or times of bursts.
(*e*) Troop safety measures and similar precautions with respect to the civilian population and institutions of cultural, industrial, or economic significance.

(2) Upon the commander's decision to employ an atomic demolition munition (ADM), the engineer designates the emplacing and firing unit. The engineer is also responsible for the supply and movement of the equipment, material, and personnel to support the ADM mission ((S) FM 5–26). Specific demolition missions which require technical assistance beyond the organic capability of the engineer groups will require attachment of additional technicians on a mission basis.

b. Staff. The duties of command and staff officer personnel are shown in FM 101–5 and SR 605–105–5. The enlisted members of the various staff sections are listed in the applicable Tables of Organization (TOE); and their duties are outlined in AR 611–201.

CHAPTER 3
ENGINEER COMBAT GROUP

Section I. CHARACTERISTICS

14. Composition

a. The major nondivisional enginer combat unit within the corps and army areas is the engineer combat group. A combat group is a flexible organization consisting of a headquarters and headquarters company and a varying number of nondivisional engineer combat units. The number of engineer troop units to be employed in a particular operation depends upon the mission; combat engineer support required; character, disposition, and capabilities of the enemy; terrain and weather; availability of engineer troop units; and other pertinent facts.

b. A typical engineer combat group assigned to a type corps may consist of three engineer combat battalions, an engineer light equipment company, an engineer panel bridge company, an enginer float bridge company, and an engineer dump truck company. A typical enginer combat group assigned to army may have three engineer combat battalions, an engineer light equipment company, three engineer float bridge companies, two panel bridge companies, and one dump truck company.

15. Mission

The mission of the engineer combat group is to perform, for corps or army, large-scale coordination engineer operations of a nondivisional combat engineer support nature within a specified area or field of responsibility.

16. Major Items of Equipment

The major items of equipment of the engineer combat group are listed in the applicable TOE's of the units assigned to the group.

17. Mobility

The engineer units assigned to the combat group are 100 percent mobile.

18. Assignment

The engineer combat group is assigned to a type field army or independent corps. There are normally three engineer combat groups in a type corps area and three combat groups in an army service area for a total of 12 in a type field army.

19. Capabilities

The capabilities of the engineer combat group are the sum of the capabilities of its assigned or attached units operating as an entity. Each of the engineer units of the nondivisional engineer combat category is administratively self-contained, mobile, and capable of operating individually, except that the bridge companies do not have sufficient organic personnel for rapid emplacement of their bridging and normally provide only technical assistance and supervision. In a major tactical operation, a number of nondivisional engineer combat units may work together on a task in support of combat forces. Coordination is effected by placing them under a single engineer commander. This is usually the commander of the engineer combat group. The group's headquarters and headquarters company is a TOE unit which directs the nondivisional engineer combat units which are assigned or attached thereto. The major engineer unit of the group is the engineer combat battalion. The number and types of engineer units assigned to the group depend upon the situation and vary for different operations or in the course of the same operation.

20. Employment

The engineer combat group normally operates as part of a brigade, although it may operate directly under corps or army or independently in a special task force. The corps group may operate from the corps rear boundary forward into the divisional area, primarily on an area assignment basis. The group normally designates one battalion for general support of a division. Routine support is coordinated at battalion level, but major operations are coordinated through group or brigade and division. Corps battalions or the entire group may be assigned a direct support mission or may even be attached. The army engineer combat group may operate from the rear boundary forward into the corps area, rendering primarily general support on either an area or task basis. Coordination is primarily at the brigade level.

Section II. GROUP HEADQUARTERS

21. Mission

The mission of the group headquarters (fig. 2) is to plan and coordinate the operations of the group comprising engineer combat battalions and other assigned or attached units engaged in engineer combat support activities; to command the assigned or attached units; and to supervise their administration, supply, and maintenance.

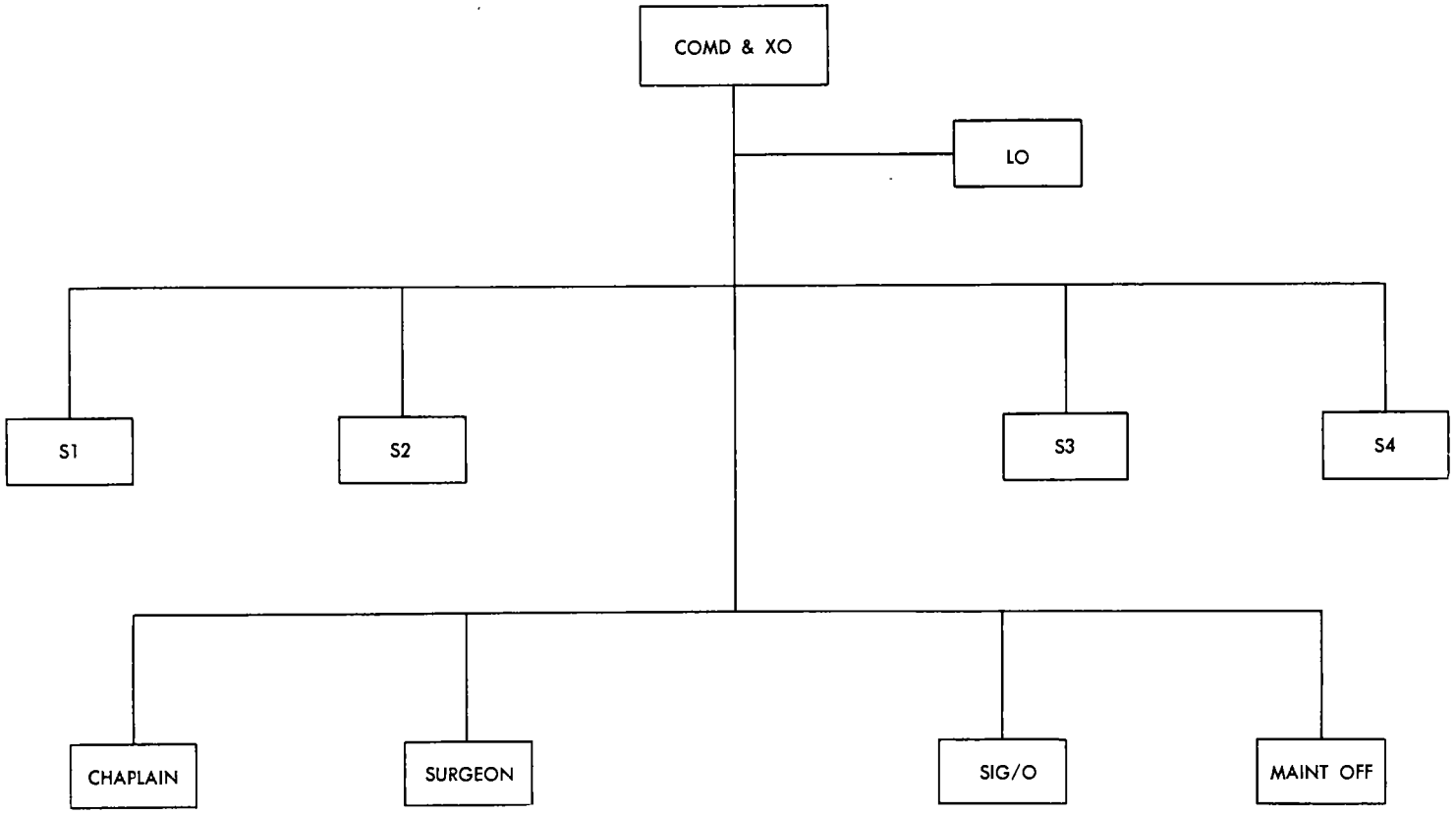


Figure 2. Organization chart, group headquarters.

22. Capabilities

The engineer combat group headquarters is capable of—

a. Providing staff planning and supervision of operations of assigned and attached units.

b. Conducting engineer reconnaissance by air and ground means; supervising the collection of intelligence information; and evaluating and disseminating engineer intelligence.

c. Providing fixed and rotary wing aircraft for support of the reconnaissance, combat support activities, and employment of atomic demolition munitions of subordinate units.

d. Supervising and assisting assigned and attached units in administrative, supply, and maintenance matters.

e. Operating the group communication system.

f. Supervising medical service and sanitation within the group.

23. Duties of Personnel

a. Group Commander. The group commander commands the group and is responsible for its operations and administration. He has no fixed post of duty but locates himself where he can best influence and direct the most decisive phase of group operations. More specifically, the group commander's duties include the following:

(1) Responsibility for the proper administration, unit supply, mess, quarters, discipline, and morale of the group.

(2) Direction and control of the tactical and operational employment of all units within the group.

(3) Evaluation of intelligence, making estimates of the situation, making decisions, and giving guidance for staff planning.

(4) Supervision of the various staff sections in the planning and execution of their assigned duties.

(5) Supervision of the supply and maintenance activities of all units within the group.

(6) Supervision of the training of all units within the group.

(7) Responsibility for liaison between next higher command and with supported organizations.

b. Staff.

(1) *Executive officer.* The executive officer is second in command. He supervises the staff; and he controls and coordinates staff activities in accordance with the orders and policies of the group commander.

(2) *Adjutant.* The adjutant, assisted by the personnel officer, supervises all personnel and administrative matters of the subordinate units. He is responsible for the maintenance and publication of such records as pay records,

promotions, assignments, transfers, awards, leaves, courts-martial, and casualties of the headquarters company; and, if so directed by the group commander, he has the same responsibility to the separate companies assigned or attached to the group. In addition, he is responsible for the publication and authentication of all orders and instructions of the commander except combat orders and certain technical instructions. He directs the operations of the headquarters message center. He assists and advises the group commander and subordinate units in administrative matters.

(3) *Intelligence officer (S2).* The intelligence officer is responsible for collecting, evaluating, and disseminating engineer information. He keeps the S2 situation map, trains others in intelligence work, and is responsible for engineer and combat intelligence for the organization. He conducts reconnaissance and coordinates reconnaissance activities within the group. He assists and advises the group commander and subordinate units on matters relating to intelligence.

(4) *Operations and training officer (S3).* The operations and training officer directs the activities of the operations and training section. He plans group training and issues training directives. He plans allocations of engineer troops, materiel, and construction equipment to various tasks and prepares group operation orders. He prepares plans and designs for accomplishing engineer tasks. He recommends security measures for group headquarters, keeps the engineer operations situation map, and prepares tactical and technical reports as directed.

(5) *Supply officer (S4).* The supply officer advises the group commander and subordinate units on matters pertaining to supply and food service. Although the group S4 is not in the chain of supply for attached or assigned units, he coordinates requirements for supplies, equipment, and construction materials and coordinates procurement of these materials. He maintains close liaison with the group S3, the brigade S4, and all supply installations. He recommends priorities of issue and estimates future requirements. He supervises the activities of the maintenance officer and directs the operations of the supply and maintenance section.

(6) *Maintenance officer.* The group maintenance officer advises the group commander, the group staff, and subordinate unit commanders within the group on all technical aspects of equipment maintenance and operation,

and on training equipment operators. He assists the group S3 in the preparation of equipment schedules and equipment allocations by furnishing technical information and advice as to the capabilities and limitations of equipment.

(7) *Signal officer.* The signal officer advises the group commander and subordinate unit commanders on matters of signal communication technique and signal security. He makes plans and recommendations for the group communication system; receives and distributes SOI's; and establishes, operates, and maintains the group communication system. He supervises and instructs communication center personnel in the functions of a message center and signal security. He gives technical assistance to S4 on supply of signal communication material. If the initial and successive locations of the battalion command post (CP) are not prescribed by higher authority, he makes recommendations for them. He supervises technical training of communication personnel in the group.

(8) *Chaplain.* The chaplain is adviser to the group commander and staff on all matters pertaining to religion, welfare, and moral activities of the command. He conducts religious services, including funerals. He corresponds with relatives of deceased personnel, coordinates the religious work of various welfare societies, prepares reports on religious and moral activities of the command, and prepares estimates of funds for religious activities.

(9) *Group surgeon.* The surgeon is the adviser to the group commander and staff on all matters pertaining to the health and sanitation of the group. He inspects the areas in which units of the group are located, particularly the separate company areas. He assists the medical officers of the subordinate units within the group.

(10) *Liaison officer.* The liaison officer is the representative of the group to the headquarters to which he is sent. He is responsible for knowing the group mission and situation at all times and for making such information available to the commander and staff of the visited organization. He must familiarize himself with the situation of the visited organization and make arrangements for securing information required by his mission and for transmitting this information to the group. The liaison officer is responsible for furthering harmonious cooperation between the group and the organization to which he is sent.

(11) *Sergeant major.* The group sergeant major is the chief enlisted man in the group and works under the direct supervision of the adjutant. He works closely with the sergeant majors of the attached or assigned battalions and with the first sergeants of the separate companies. He establishes operating procedures for routine correspondence and directives. The sergeant major is the chief enlisted adviser to the group commander.

Section III. HEADQUARTERS COMPANY

24. Mission

The mission of headquarters company is to—

a. Provide a command and administrative element for the company.

b. Provide personnel to the group staff sections and aviation platoon.

c. Defend itself against hostile ground attack.

25. Organization

Headquarters company (fig. 3) consists of the company officers and the enlisted personnel who work in company headquarters and group headquarters sections. Those personnel who are assigned duties in group headquarters sections work under the supervision of the respective group staff officers. The company is organized into the following elements:

a. A company headquarters which commands assigned enlisted personnel; provides support, including supply, mess, and organizational maintenance of equipment, for the headquarters elements; and provides company administration.

b. An administrative section which processes all official correspondence, memoranda, reports, and orders; maintains personnel records and files and prepares personnel action documents; controls assignment of personnel within the group; operates the headquarters message center; supervises and inspects the administrative activities of subordinate units; and assists and advises the group commander and subordinate units in administrative matters.

c. An intelligence section which collects and evaluates information; processes and disseminates intelligence, with emphasis on engineer aspects; conducts reconnaissance and coordinates reconnaissance activities within the group; conducts terrain analysis; photographs engineer projects and reconnaissance information; and assists and advises the group commander and subordinate units on matters relating to intelligence.

d. An operations section which prepares operational orders and

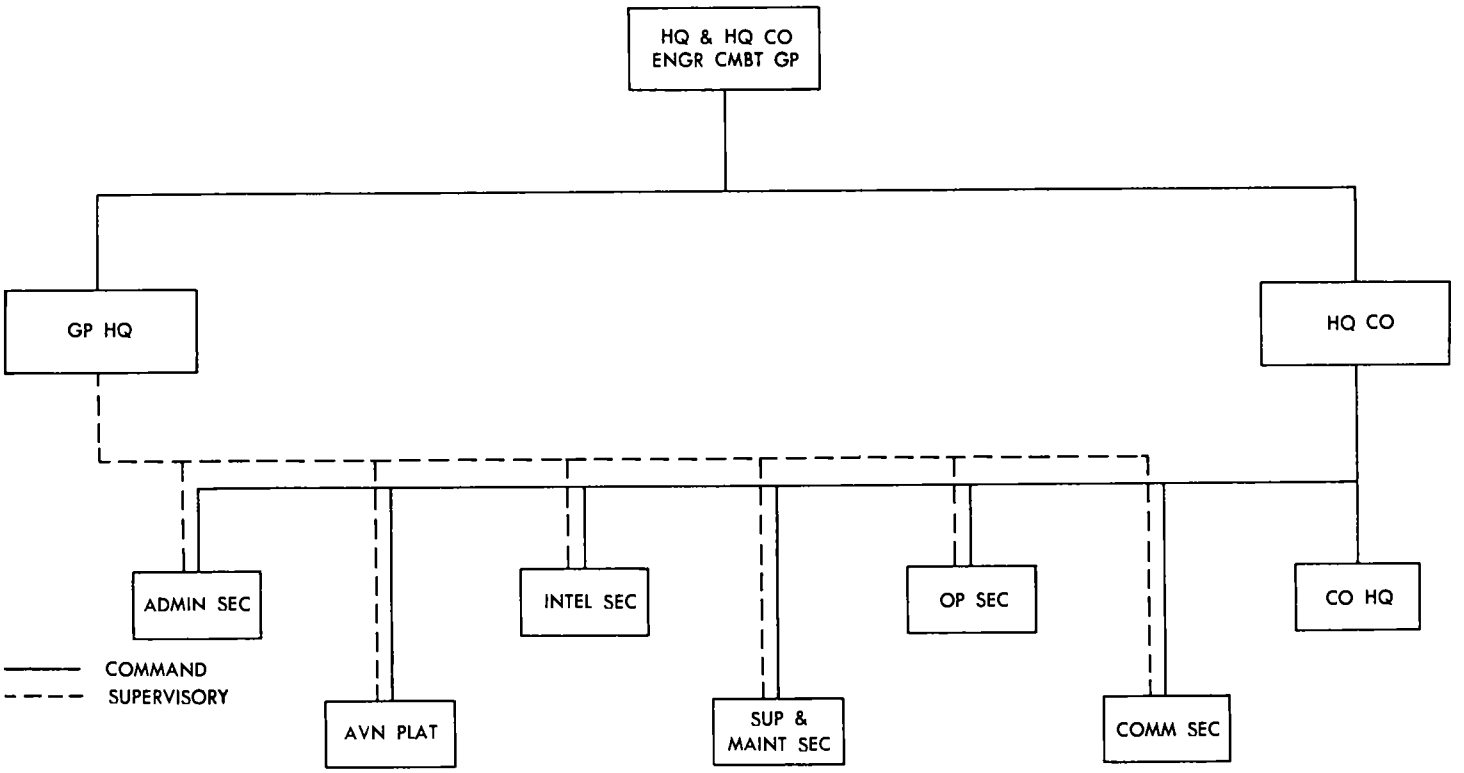


Figure 3. Organization chart—headquarters and headquarters company, engineer combat group.

directives; estimates of labor, materials, and equipment; and data relative to organization and training.

e. A supply and maintenance section which coordinates requirements for supplies, equipment, and construction material and coordinates procurement of these materials; supervises and inspects food service activities within the group; assists and advises the group commander and subordinate units on matters pertaining to supply and food service; supervises and inspects maintenance of equipment within the group; assists subordinate units in overcoming problems of maintenance and repair; and advises the group commander and subordinate units on maintenance matters. The group headquarters is not in the chain of supply for subordinate units.

f. An aviation platoon which operates and maintains two fixed wing aircraft, and four reconnaissance and six medium cargo helicopters in support of combat engineering activities of the group. The aircrafts are available for utilization by units within the group to: provide command, control, liaison, communication, administration and supply; provide lift and placement of nuclear demolition teams and their equipment; provide means to collect intelligence and to make reconnaissance flights; assist in river-crossing operations by providing the vehicle to shift personnel and bridge components from one site or shore to another, or to generally assist from rear areas.

g. A communications section which plans and coordinates communication activities within the group; operates the headquarters radio and wire communication facilities; provides wire communications (fig. 4) to subordinate units; controls the group radio network (fig. 5); assists and advises the group commander and subordinate units on matters pertaining to communications; and provides organizational maintenance for organic radios.

26. Capabilities

Headquarters company is capable of the following:

a. Providing command and administrative support for the company.

b. Providing personnel for group staff sections and aviation platoon to perform the tasks outlined in paragraph 22.

c. Providing minimum security for group headquarters command post.

27. Employment

The company feeds, clothes, supplies, quarters, and handles the administration for all personnel in the group headquarters and in its own operating sections. The section chiefs and the company commander informally arrange their working schedules to permit

group headquarters personnel to participate in military training activities, administrative housekeeping details, and security of the bivouac area.

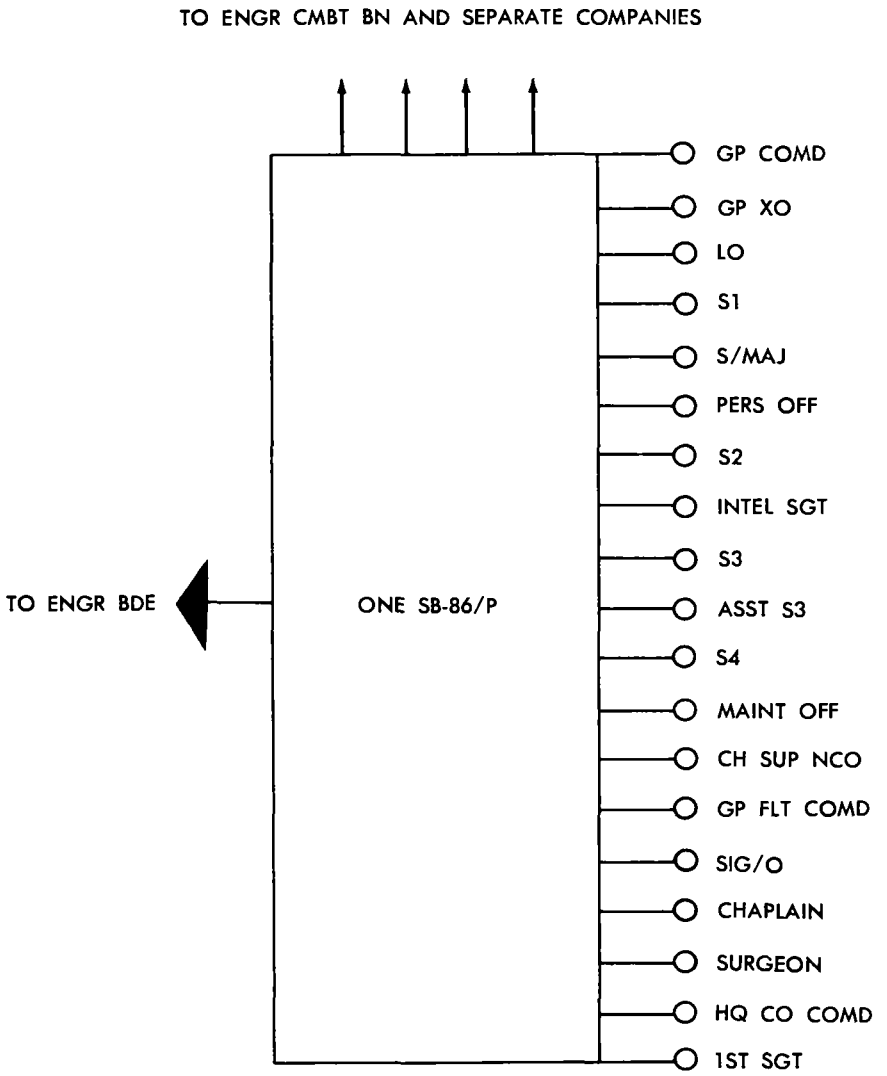


Figure 4. Wire net, engineer combat group headquarters.

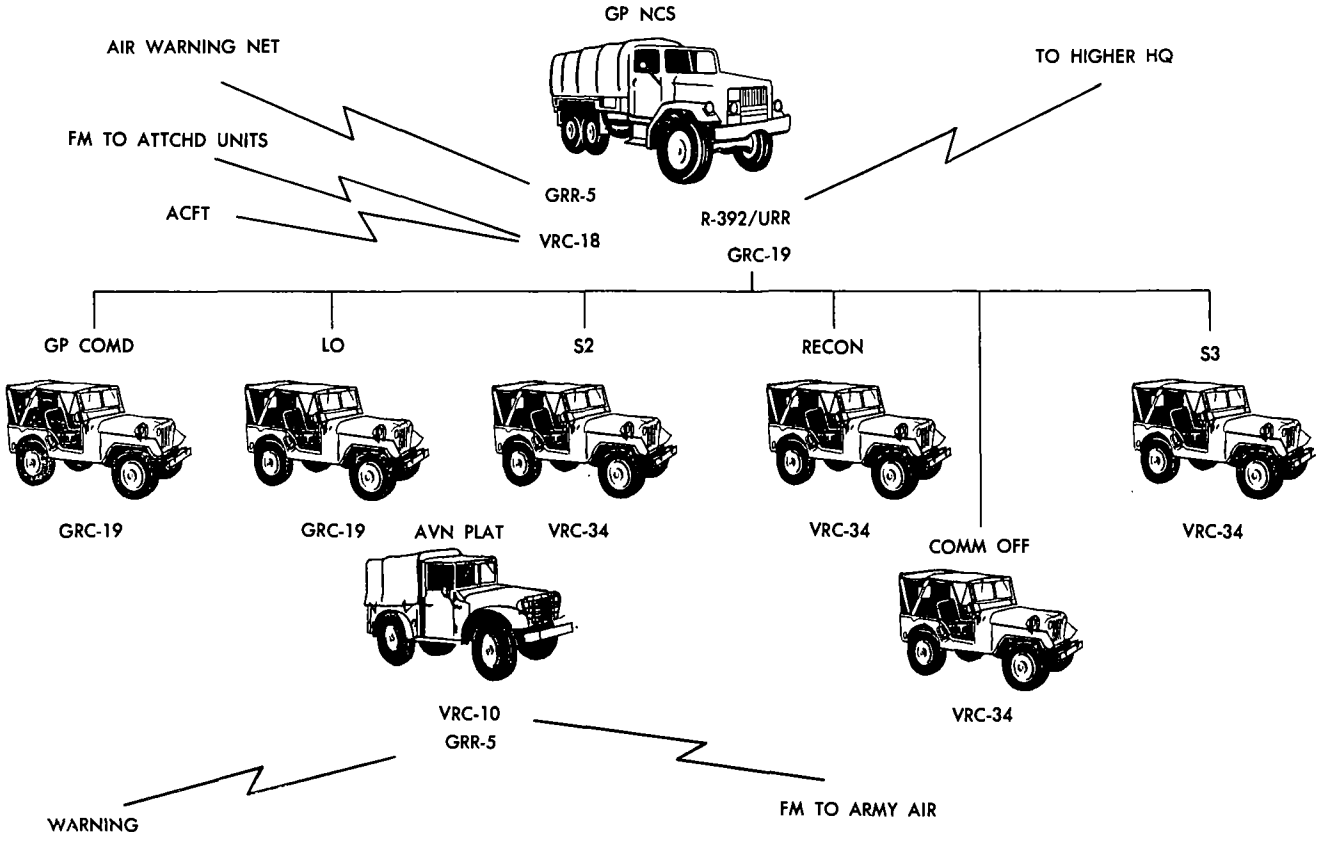


Figure 5. Radio net, engineer combat group headquarters.

CHAPTER 4

ENGINEER COMBAT BATTALION, ARMY

Section I. CHARACTERISTICS

28. Composition

The engineer combat battalion, Army, consists of a headquarters and headquarters company and three identical engineer combat companies (fig. 6). In all places where the engineer combat battalion is mentioned in this manual, the references are to the engineer combat battalion, Army. Any reference to division engineer battalions will specify divisional engineer battalion or the type division to which it is organic.

29. Mission

The mission of the engineer combat battalion is to increase the combat effectiveness of corps and army by means of general engineer work and to reinforce divisional engineers when required. The engineer combat battalion may also engage in infantry type combat.

30. Major Items of Equipment

The major items of equipment of the engineer combat battalion are listed in TOE 5–35.

31. Mobility

The engineer combat battalion is 100-percent mobile. For air transportability, see FM 101–10.

32. Assignment

The engineer combat battalion is assigned to corps or army, with normal further assignment to an engineer combat group.

33. Capabilities

At full strength, the engineer combat battalion is capable of providing engineer support as follows:

a. Staff planning and supervision of battalion operations.

b. Engineer reconnaissance and intelligence.

c. Construction, repair, and maintenance of roads, fords, culverts, fixed or floating bridges, air landing facilities, command posts, supply installations, shelter installations, and defense installations.

d. Preparation and removal of obstacles, including minefields.

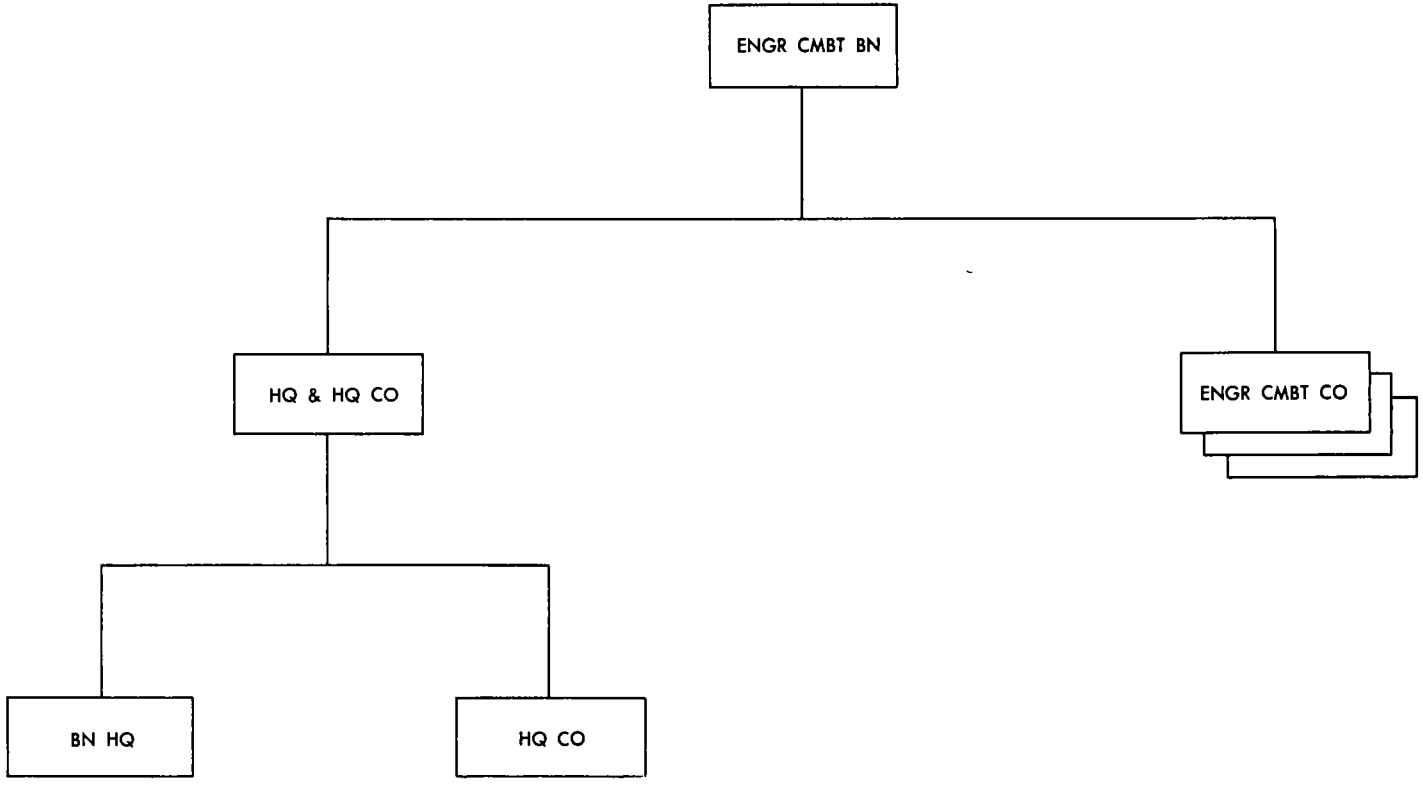


Figure 6. Organization chart, engineer combat battalion, Army.

e. Preparation, execution, and removal of demolitions. This includes the employment of atomic demolition munitions (ADM).

f. Installation and operation of field water supply facilities.

g. Construction of deceptive facilities, placement of deceptive devices, and advice and assistance on the use of camouflage.

h. Engaging in infantry type combat.

34. Method of Operation

a. Assignments.

(1) The group commander normally assigns an engineer combat battalion to a given area, with responsibility for all engineer operations within that area, including combat type construction, route maintenance, and water supply. Assignment of tasks within the area is directed by the battalion commander.

(2) When the magnitude of specific tasks warrants, a combat battalion may be assigned specific tasks instead of area type missions.

(3) The construction capabilities of the battalion can be augmented by the attachment of engineer equipment, with operators, from the light equipment company and of trucks, with drivers, from the engineer dump truck company. Servicing and maintenance of the attached equipment is normally performed by the battalion unless the parent company is bivouacked within reasonable supporting distance.

(4) For emplacement of bridging, the appropriate unit of the group delivers the bridge to the site and provides technical direction to the engineer combat battalion in the emplacement of the bridge.

b. Corps Area.

(1) Normal nondivisional engineer support within the corps area is one combat group supporting each committed division. Within the division area, it is normal to have one engineer combat battalion give close support. The other two battalions would be dispersed in a lateral formation from division rear boundary to corps rear boundary (fig. 36). These two battalions would be given area-type assignments, with further missions of providing general support to corps units within their respective areas.

(2) When the group places an engineer combat battalion in direct support of a division, the tasks to be performed are established by liaison with the division engineer. The latter does not exercise any command or operational

control over the group engineer combat battalion; but all reasonable requests which he may make are executed by the battalion without reference to group headquarters, unless they are in conflict with group policies or orders.

(3) The division engineer normally exercises operational control over engineer units attached to the division under authority delegated by the Commander.

(4) If the engineer combat battalion is attached to division without further subattachment, orders are received through division command channels unless the division commander has delegated operational control of attached engineer units to his division engineer. Close liaison, however, is maintained with the division engineer, to insure coordination of effort.

c. Army Area.

(1) Area assignments are given primarily to the engineer combat battalion, while the construction units and other special units of the army engineer echelon operate primarily on task assignments.

(2) Normally, an engineer combat group from the army area will be placed in support of each corps. The battalion will have an area assignment and will be responsible for general engineer work in the assigned area. The battalion will usually allot areas of its responsibility to its assigned engineer companies and will assign each company an appropriate mission.

Section II. BATTALION HEADQUARTERS

35. Mission

The mission of battalion headquarters is to provide command and staff planning, direction, and supervision for the battalion.

36. Organization

Battalion headquarters (fig. 7) consists of the command and staff elements.

37. Duties of Personnel

a. Battalion Commander. The battalion commander directs, supervises, and controls the activities of all organic and attached engineer troops. He prepares plans, policies, and orders. He supervises unit activities and conducts personal reconnaissance. He maintains close contact with the group commander and his staff and with supported units. He requests additional engineer support from the group when required and coordinates planning

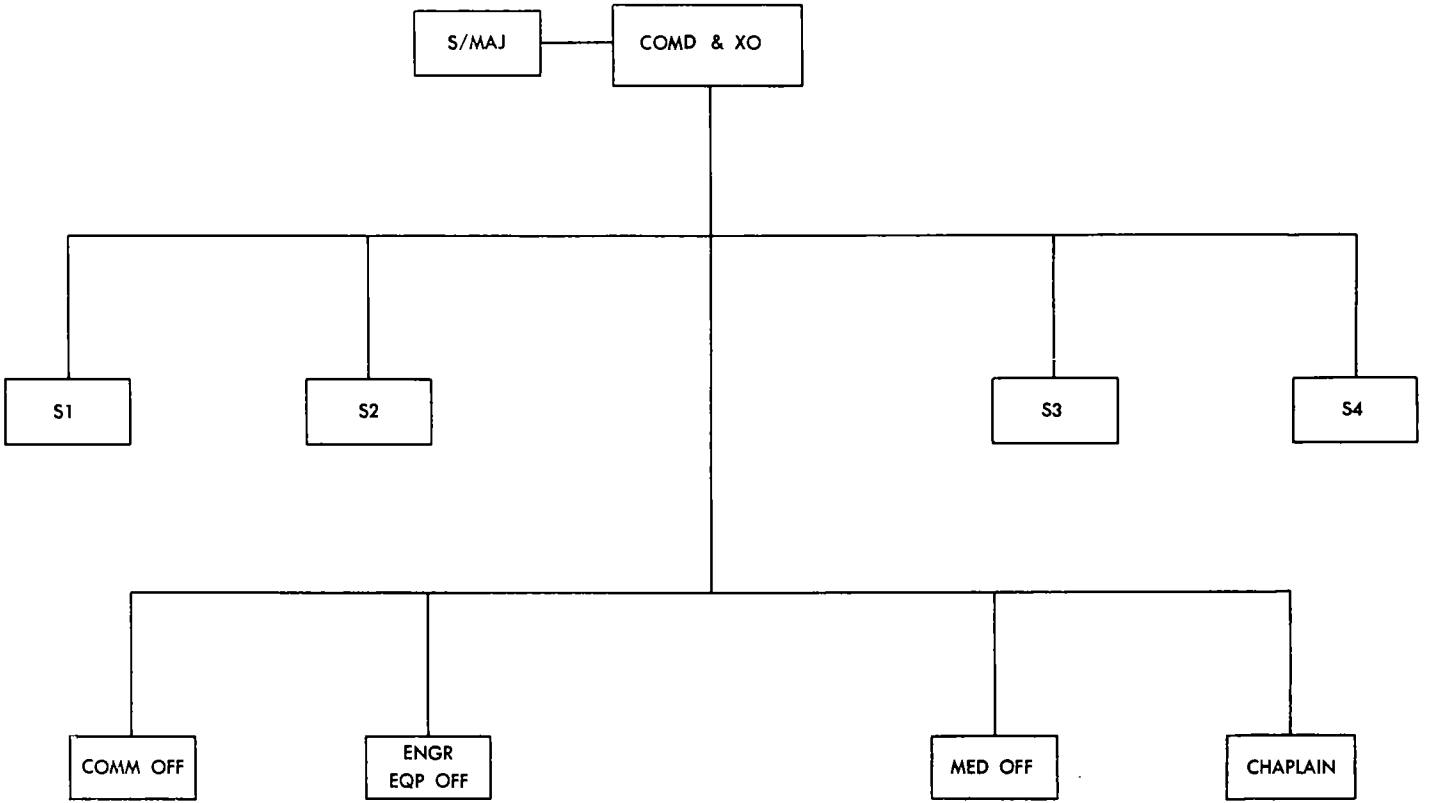


Figure 7. Organization chart—headquarters, engineer combat battalion, army.

with the group commander. Further duties of the battalion commander are outlined in FM 101–5.

b. Staff.

(1) *Executive officer.* The executive officer is second in command. He is responsible for supervision of the staff, and he controls and coordinates all staff activities in accordance with the orders and policies of the commander. The executive officer remains at the battalion headquarters when the commanding officer is absent. He requires the staff to keep him informed of the operational status of the battalion at all times.

(2) *Adjutant (S1).* The adjutant handles the battalion personnel and administrative matters. These matters include postal service, pay records, promotions, assignments, transfers, awards, leaves, courts-martial, casualties, the battalion journal, routine orders, and the publication and authentication of all orders and instructions of the commander except combat orders and certain technical instructions. The adjutant also maintains reports of strength and personnel statistics. He is responsible for the movement and internal arrangement, organization, and operations of battalion headquarters.

(3) *Intelligence officer (S2).* The intelligence officer is charged with the responsibility of collecting, evaluating, and disseminating engineer information. He keeps the S2 situation map, trains others in intelligence work, and supervises engineer intelligence, combat intelligence, and engineer reconnaissance activities within the battalion. He is responsible for map procurement and distribution. The S2 prepares terrain analyses and studies. He is assisted by one reconnaissance officer, who works within the S2 section. Although the reconnaissance officer is assigned to the S2 section, he performs reconnaissance missions for the entire organization.

(4) *Operations and training officer (S3).* The operations and training officer directs the activities of the operations and training section. He plans battalion training and assists in its supervision. He plans allocation of engineer troops and construction equipment to various tasks, prepares battalion operation orders, arranges details for movement of the battalion under tactical conditions, and prepares plans and designs for accomplishing engineer tasks. He recommends security measures for battalion headquarters, keeps the engineer operations situation map, and prepares tactical and technical reports as directed. The

S3 makes a continuing estimate of the situation so that he can make recommendations at any time for the employment of the battalion.

(5) *Supply officer (S4).* The S4 is the battalion property book officer, and he maintains all supply records. He supervises the requisition, receipt, storage, issue, and distribution of all supplies. In cooperation with S2 and S3, he studies and collects information on available local resources and captured enemy engineer supplies. He advises the battalion commander as to the availability of supplies and materials and, in coordination with S3, recommends their allocation. He recommends the number and location of water supply points. The S4 maintains close liaison with the group S4 and all supply installations.

(6) *Engineer equipment officer.* The engineer equipment officer advises the commander, staff, and unit commanders within the battalion on the technical aspects of automotive and equipment operations and maintenance; supervises repair and maintenance of equipment and vehicles; supervises the keeping of maintenance records; and directs the training of drivers, mechanics, and equipment operators. The engineer equipment officer assists the battalion S3 in the preparation of equipment schedules and equipment allocations by furnishing information and advice as to the capabilities and limitations of equipment.

(7) *Communication officer.* The communication officer advises the commander on matters of signal communication technique. He makes plans and recommendations for the battalion communication system; and he establishes, operates, and maintains it. He supervises and instructs communication center personnel in the function of a message center and supervises technical training of communication personnel within the battalion. He prepares orders, standing signal instructions, and signal operation instructions or secures them from appropriate headquarters. The communication officer supervises the signal security in the battalion. He gives technical assistance to S4 on supply of signal communication material. If the initial and successive locations of the battalion command post (CP) are not prescribed by higher authority, he makes recommendations for them.

(8) *Chaplain.* The chaplain is adviser to the battalion commander and staff on all matters pertaining to religion,

welfare, and morale activities of the command. He conducts religious services, including funerals. He corresponds with relatives of deceased personnel, coordinates the religious work of various welfare societies, and prepares reports on religious and morale activities of the command.

(9) *Medical officer.* The medical officer supervises the medical services of the battalion. He serves as adviser to the battalion commander and staff on matters affecting the health of the command and the sanitation of the battalion area. Specifically, he instructs battalion personnel in hygiene, military sanitation, and first aid; makes medical and sanitary inspections; establishes and operates the battalion first aid station and dispensary; requisitions medical equipment and supplies for the battalion; prepares the battalion medical plan; supervises collection and evacuation of wounded; and supervises the preparation of casualty lists and other records pertaining to the medical service.

(10) *Sergeant major.* The battalion sergeant major is the chief enlisted man in the battalion and is the adjutant's principal assistant for other than personnel matters. He supervises and directs the administrative section in the preparation of correspondence records, forms, reports, and orders. He establishes operating procedures for routine correspondence and directives. The sergeant major is the liaison channel between battalion headquarters and the first sergeants. He is the chief enlisted adviser to the battalion commander.

38. Capabilities

Battalion headquarters is capable of providing—

a. Staff planning and supervision of battalion operations.

b. Engineer supply and service, including four water points.

c. Engineer reconnaissance.

d. Operation of the battalion communication system.

e. Organizational maintenance of organic automotive and construction equipment and organizational maintenance support to the engineer combat companies.

f. Medical service for battalion and attached units, including emergency medical treatment; operation of a battalion aid station; evacuation of casualties, if practicable; and supervision of sanitation.

g. Preparation and execution of demolitions, including atomic demolition munitions (FM 5–26).

39. Methods of Employment

The battalion headquarters is normally employed in one echelon proximate to the line companies or a major supported unit. A rear echelon is established when the battalion is committed to combat or other operations close to the enemy.

40. Method of Operation

The combat company of the battalion is assigned missions by the battalion commander. The battalion commander may assign the companies specific tasks or areas of responsibility for general or special engineer work as determined by the operational situations. Necessary augmentation of the combat companies, with equipment, operators, and maintenance personnel from the battalion headquarters company or separate units, or from both, of the group, is accomplished when required.

41. Training

Battalion headquarters has the following training responsibilities:

a. It conducts on-the-job training for personnel within the staff sections.

b. The S–3 section supervises training throughout the battalion. Training is conducted in accordance with guidance and directives issued by the group commander and in accordance with Army Training Program (ATP) 5–5, field manuals, technical manuals, Army Training Test (ATT) 5–35–1, and other training publications.

c. Battalion headquarters assists in training other units within the group, and other services within corps and army, in combat engineering subjects.

Section III. HEADQUARTERS COMPANY, ENGINEER COMBAT BATTALION

42. Mission

The mission of headquarters company is to—

a. Provide a command and administrative element for the headquarters company.

b. Provide personnel to the battalion staff sections.

c. Provide supplemental heavy equipment to the combat engineer companies.

d. Engage in an infantry type combat role as a headquarters company when required.

43. Organization

The headquarters company (fig. 8) consists of the company officers and the enlisted personnel who work in the battalion

headquarters' sections, company headquarters, and the equipment platoon. Those personnel who are assigned duties in battalion headquarters sections work under the supervision of the respective battalion staff officers. The company is organized into the following elements:

a. Company Headquarters. The company headquarters provides command and administrative services for the company; and it supervises the conduct, discipline, and appearance of company personnel. Administratively, the company headquarters feeds, clothes, supplies, quarters, and pays all men within the company. It also provides maintenance support for all vehicles within the company.

b. Administrative Section. The administrative section performs such administrative duties as processing all official correspondence, memoranda, reports, and orders; maintaining personnel records and files and preparing personnel action papers; controlling assignment of personnel within the battalion; supervising and inspecting the administrative activities of subordinate units; and assisting and advising the battalion commander and subordinate units in administrative matters.

c. Intelligence Section. The intelligence section performs such duties as collecting, evaluating, and disseminating intelligence information; conducting engineer reconnaissance and coordinating engineer reconnaissance activities within the battalion; assisting the battalion commander and the subordinate units in matters pertaining to planning and intelligence activities; and procuring and distributing maps, photomaps, and aerial photographs.

d. Operation Section. The operation section assists and advises the battalion commander on matters pertaining to operation and training, such as mission assignments and troop and equipment allocation and scheduling. It also assists subordinate units in operation and training matters. In compliance with the battalion commander's instructions, the section prepares operation orders and mission assignments to the subordinate units.

e. Supply Section. The supply section of battalion headquarters directs and supervises the suply activities of the battalion. It edits and consolidates requisitions for all classes of supplies; maintains supply records; and receives, breaks down, stores, and issues all classes of supply except repair parts, to the organic and attached units of the battalion. The water supply subsection of the supply section is organized into four water supply teams. The teams are responsible for the maintenance, installation, and operation of water points. They conduct reconnaissance for locating water points and recommend schedules for drawing water.

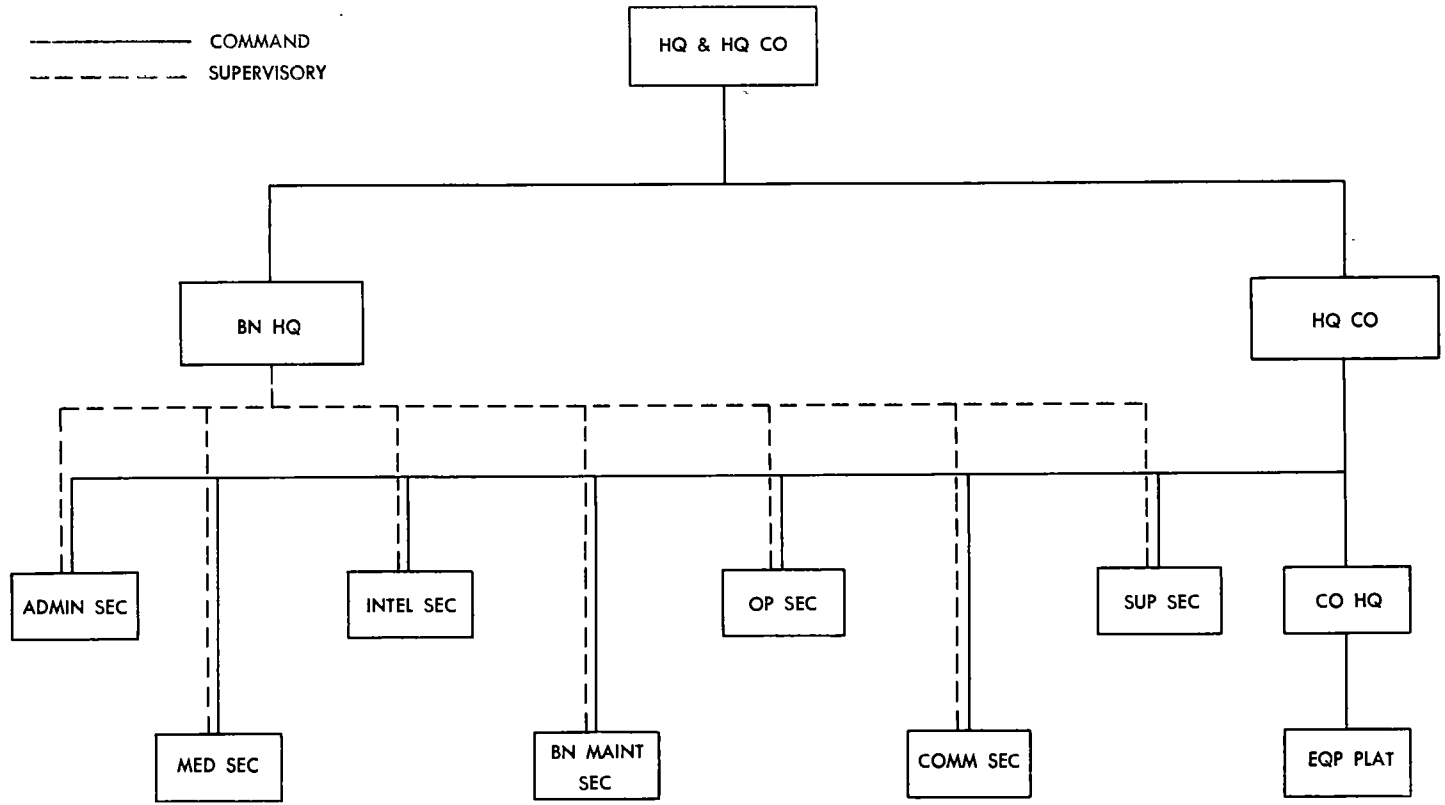


Figure 8. Organization chart—headquarters and headquarters company, engineer combat battalion, army.

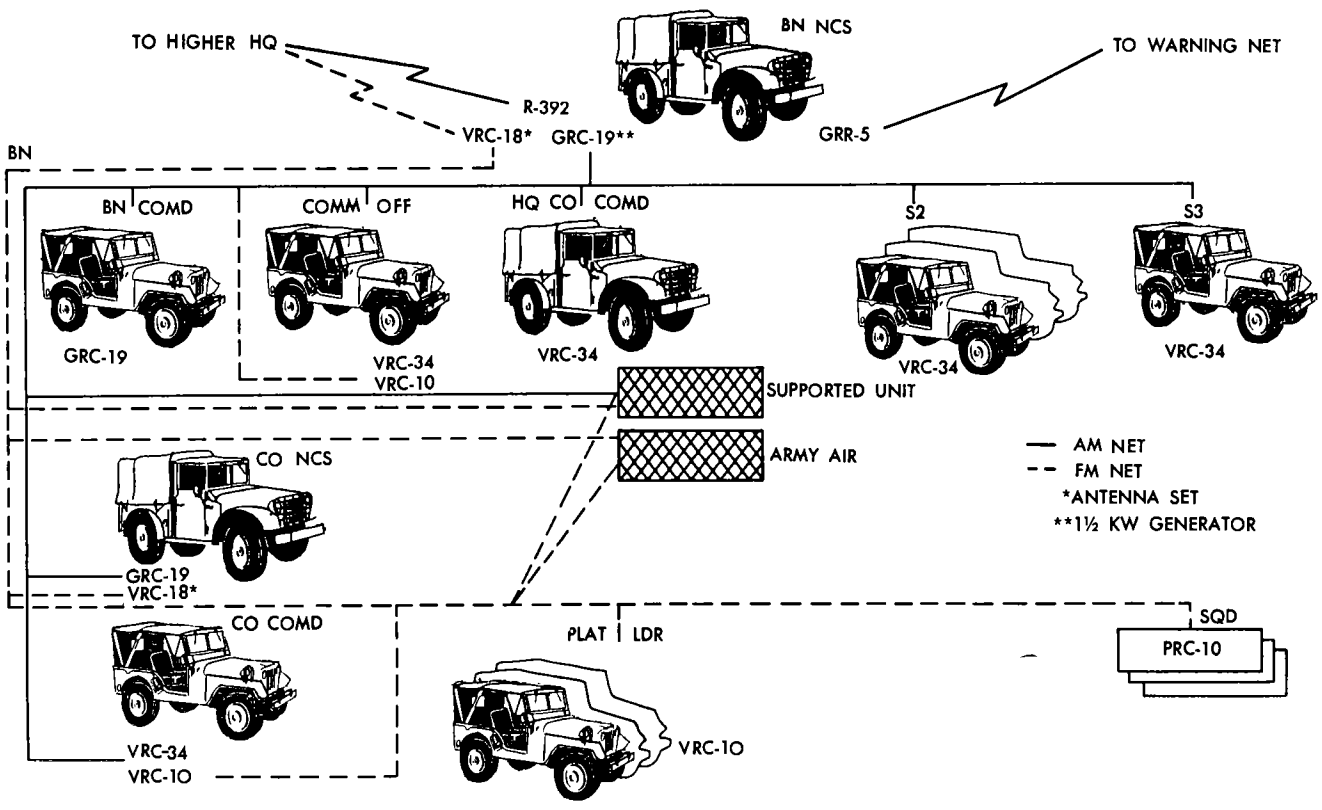
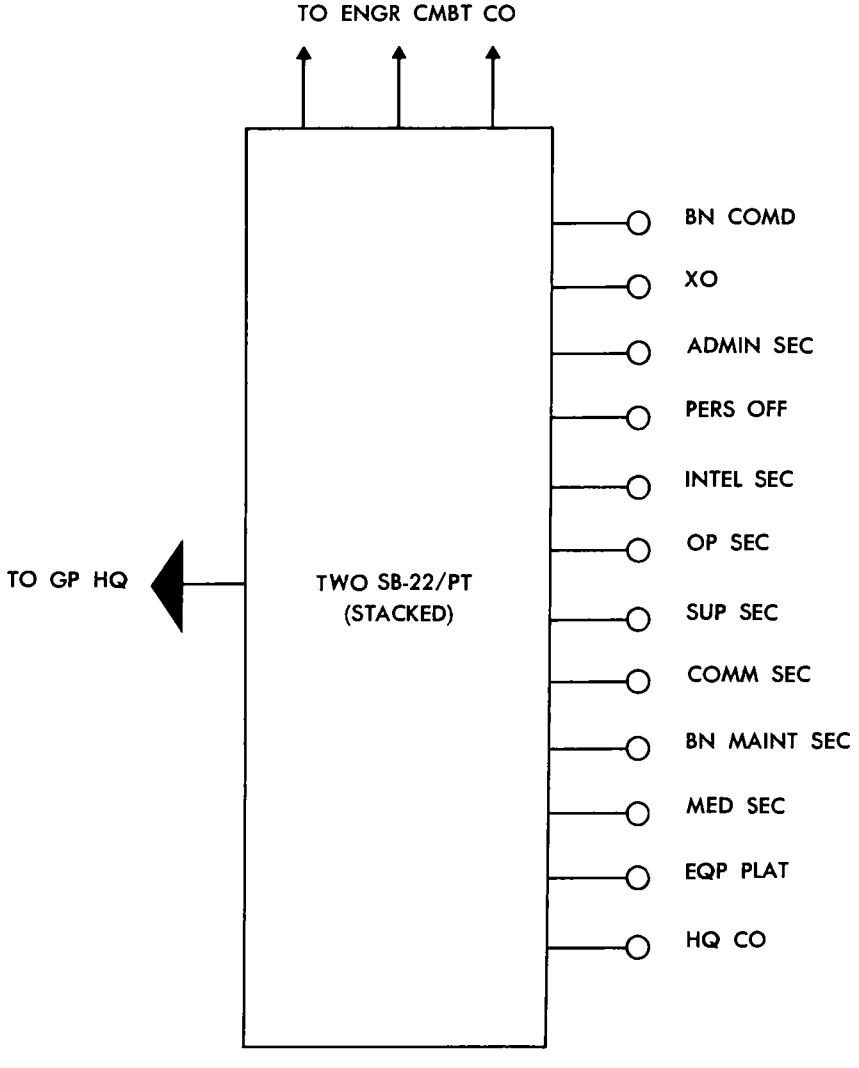


Figure 9. Radio net, engineer combat battalion.

f. Communication Section. The communication section operates the battalion radio net (fig. 9), the battalion wire facilities (fig. 10), and the headquarters message center. The section assists and advises the battalion commander and subordinate units on matters pertaining to communication; and it provides organizational maintenance for organic radios.



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NOTE: NINE TELEPHONES, TA-1/PT, ARE FOR USE AT WORKSITES.

Figure 10. Wire net, engineer combat battalion.

g. Battalion Maintenance Section. The maintenance section performs organizational maintenance for headquarters company and assists the subordinate units in the performance of their organizational maintenance for automotive and engineer equipment. Higher echelon maintenance is performed by appropriate supporting maintenance units. The section assists and advises the battalion and company commanders on the technical aspects of operation and maintenance of equipment. Repair parts for automotive and engineer equipment are supplied through, and managed by, the maintenance section for the organic and attached units of the battalion.

h. Medical Section. The medical section provides aidmen to the organic units of the battalion, operates the battalion aid station and dispensary, and evacuates casualties. The section maintains the medical records of all assigned personnel.

i. Equipment Platoon. Elements of the equipment platoon are usually placed in support of the combat companies to provide additional engineer equipment for specific tasks or missions. The supported companies are responsible for organizational maintenance of the supporting equipment. Upon completion of the task or mission, elements are returned to the control of the headquarters company commander.

44. Equipment

Major items of equipment in headquarters company are—craneshovels, motorized road graders, a pneumatic tool and compression outfit, an equipment repair shop truck, a medium tractor with angledozer blade, water purification sets, a medium wrecker, and dump trucks.

45. Capabilities

Headquarters company is capable of—

a. Providing supplemental heavy equipment and operators to elements of the battalions.

b. Providing personnel for battalion staff sections to perform the tasks outlined in paragraph 33.

c. Providing minimum security for battalion headquarters command post.

d. Defending itself against hostile ground attack.

46. Employment

The company feeds, clothes, supplies, quarters, and handles the administration for all personnel in the battalion headquarters and in its own operating sections. The section chiefs and the company commander informally arrange their working schedules to permit battalion headquarters personnel to participate in military training activities, administrative housekeeping details, and security of the bivouac area.

CHAPTER 5

ENGINEER COMBAT COMPANY

Section I. CHARACTERISTICS

47. Mission

The mission of the engineer combat company is to provide an operating component of the engineer combat battalion for performance of engineer work in support of the field army. It can also engage in infantry type combat operations when required.

48. Organization

The engineer combat company is organized into a company headquarters and three identical engineer platoons (fig. 11).

49. Capabilities

The engineer combat company is capable of—

a. Constructing, maintaining, and repairing routes of communication.

b. Assisting in the emplacement and removal of obstacles, including mines and boobytraps.

c. Preparing and executing demolitions, including atomic demolition munitions.

d. Assisting other troops in the preparation of fortifications and camouflage.

e. Performing general engineer reconnaissance.

f. Providing technical advice to supported organizations on engineering matters.

g. Assisting in deliberate river-crossing operations.

h. Performing combat engineer missions in support of combat operations to division, corps, and army units.

i. General combat-type construction, including construction of landing strips, when reinforced with additional heavy equipment.

j. Performing organizational maintenance on organic equipment.

k. Performing infantry type combat missions when required.

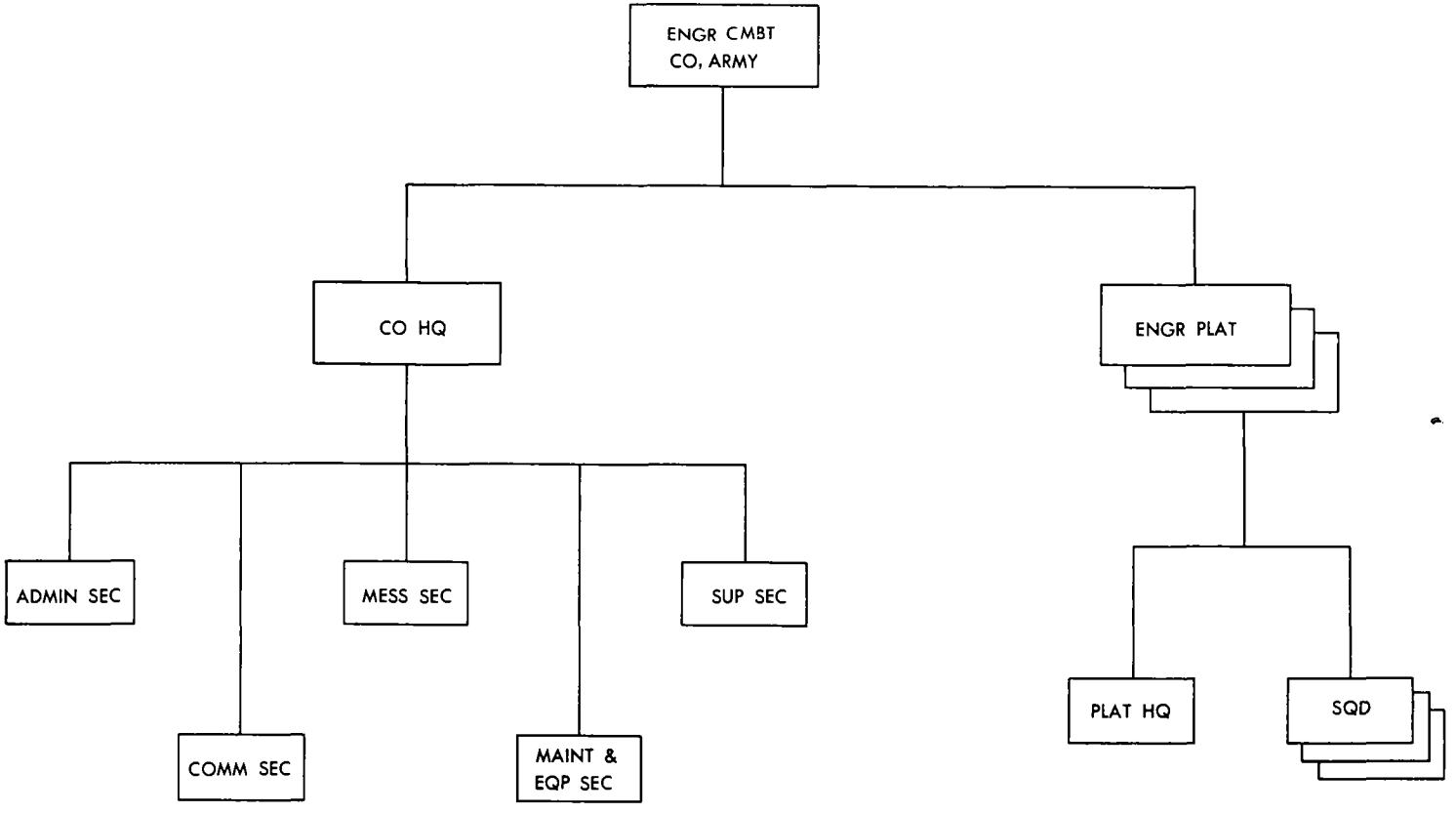


Figure 11. Organization chart, engineer combat company, army.

Section II. METHOD OF OPERATION

50. Employment

a. Each company may be given an area assignment or task assignments. Company assignments, in turn, are normally broken down into platoon tasks.

b. The company operates independently of the battalion when attached to another unit. The company may be attached when the mission requires it or when centralized control by the battalion is difficult.

c. Many assignments will necessitate continuous operations in shifts, or even extended periods of operation without relief. The company commander must balance the effects of fatigue on his men and the limited servicing on his equipment against the urgencies of the situation.

51. Administration

Most administration activities are centralized at battalion headquarters, relieving the company commander from as much administrative responsibility as possible. The companies informally furnish the necessary information for the morning report to the battalion personnel section, where the reports are prepared.

52. Supply

a. Table of organization and table of allowance equipment within the company is on hand receipt directly from the battalion S4 to the responsible individual. Requests and turn-ins are submitted to the supply section of company headquarters which consolidates them and forwards them to the battalion supply section for action.

b. Ordnance and engineer equipment repair parts are handled through the battalion maintenance section.

53. Maintenance

The assigned drivers, equipment operators, and radio operators perform first echelon maintenance on their equipment. The maintenance section and the radio repairman of company headquarters, assisted by the battalion maintenance section and the battalion communication section, perform organizational inspections, maintenance, and repair on the automotive, construction, and communication equipment of the company.

54. Communications

Radio facilities are provided for communication between squads in the platoons, between the platoons and squads, between the

platoons and company, and between company and battalion (fig. 12). Telephone and wire equipment is provided for communication between the platoons and company and between company and battalion (fig. 13).

55. Training

The engineer combat company is responsible for training its personnel in accordance with training policies of the battalion headquarters. Emphasis in training is placed on those subjects which are peculiar to the combat company missions.

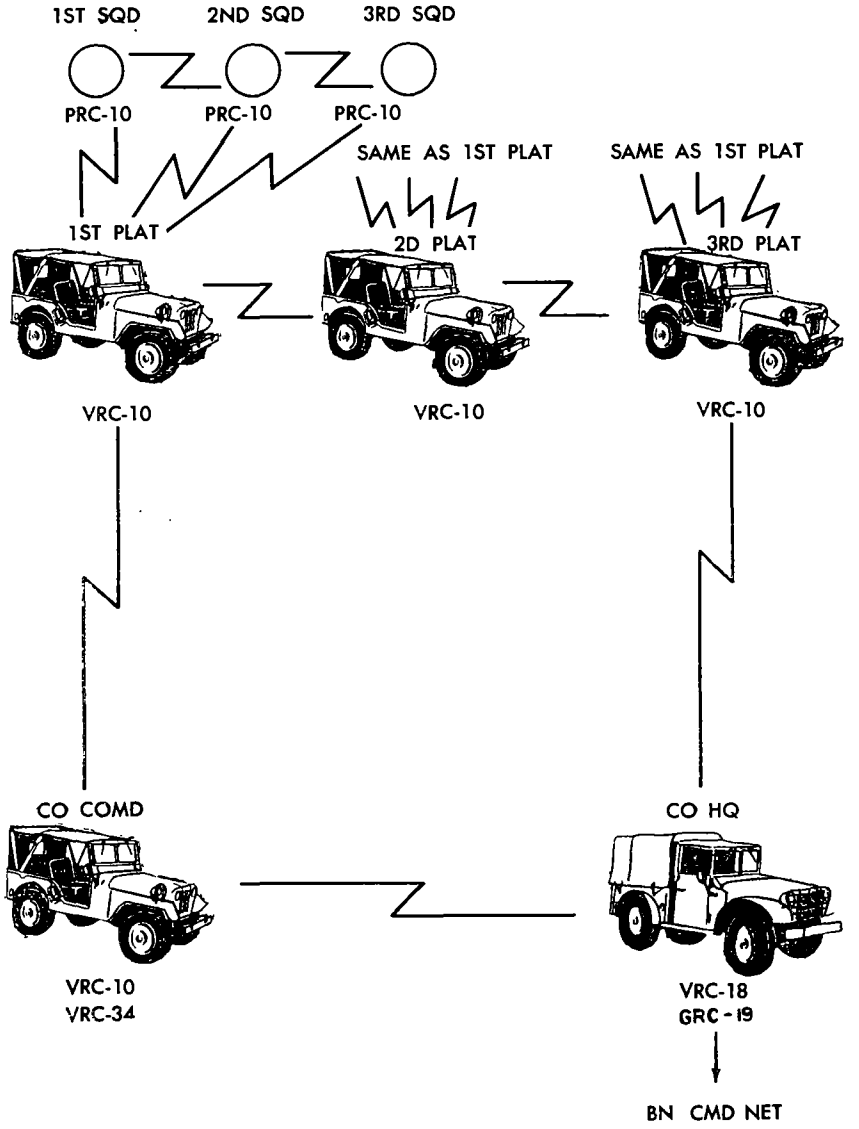
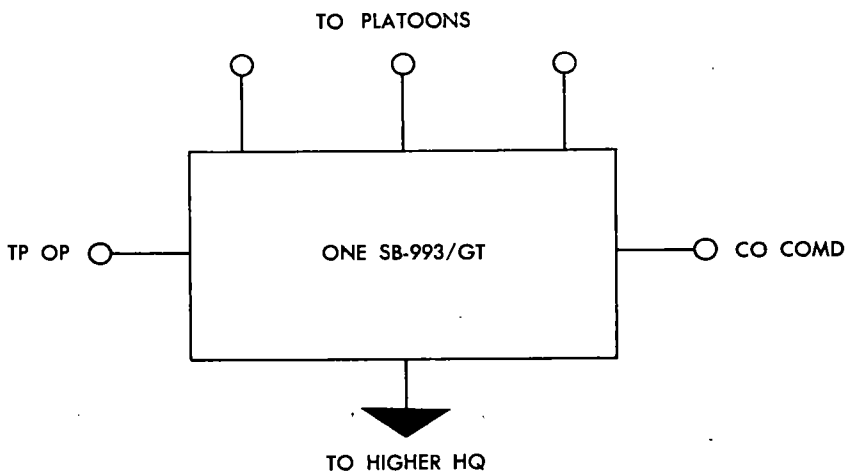


Figure 12. Radio net, engineer combat company, army.



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NOTE: TEN TELEPHONES, TA-1/PT, ARE FOR USE AT WORKSITES.

Figure 13. Wire net, engineer combat company, army.

CHAPTER 6

ENGINEER FLOAT BRIDGE COMPANY

Section I. CHARACTERISTICS

56. Introduction

Various types of engineer troop units are organized primarily as bridging units and are classified as nondivisional combat units. The engineer float bridge company falls within this classification.

57. Mission

The mission of the float bridge company is to provide personnel and equipment to load, transport, maintain, and offer supervisory assistance in the erection of tactical stream-crossing equipment. It has a secondary mission of general cargo hauling in emergencies.

58. Organization

The engineer float bridge company (fig. 14) consists of a company headquarters, an equipment and maintenance platoon, a support platoon, and five identical float bridge platoons.

59. Mobility

The company is 100 percent mobile. For air transportability, see FM 101–10.

60. Assignment

The engineer float bridge company is normally assigned to an army or separate corps and is further assigned or attached to an engineer combat group. Allocation is two float bridge companies per corps and nine per army area.

61. Capabilities

a. At full strength, the company is capable of—

(1) Providing approximately 700 feet of M4T6 floating bridge or ten (five 4-float reinforced and five 5-float reinforced) rafts or a combination of bridge and rafts (fig. 15) capable of carrying divisional loads.

(2) Providing, in support of tactical operations, light stream-crossing equipage—assault boats, a footbridge, and light tactical rafts.

(3) Furnishing technical assistance to other engineer units in bridge and raft construction.

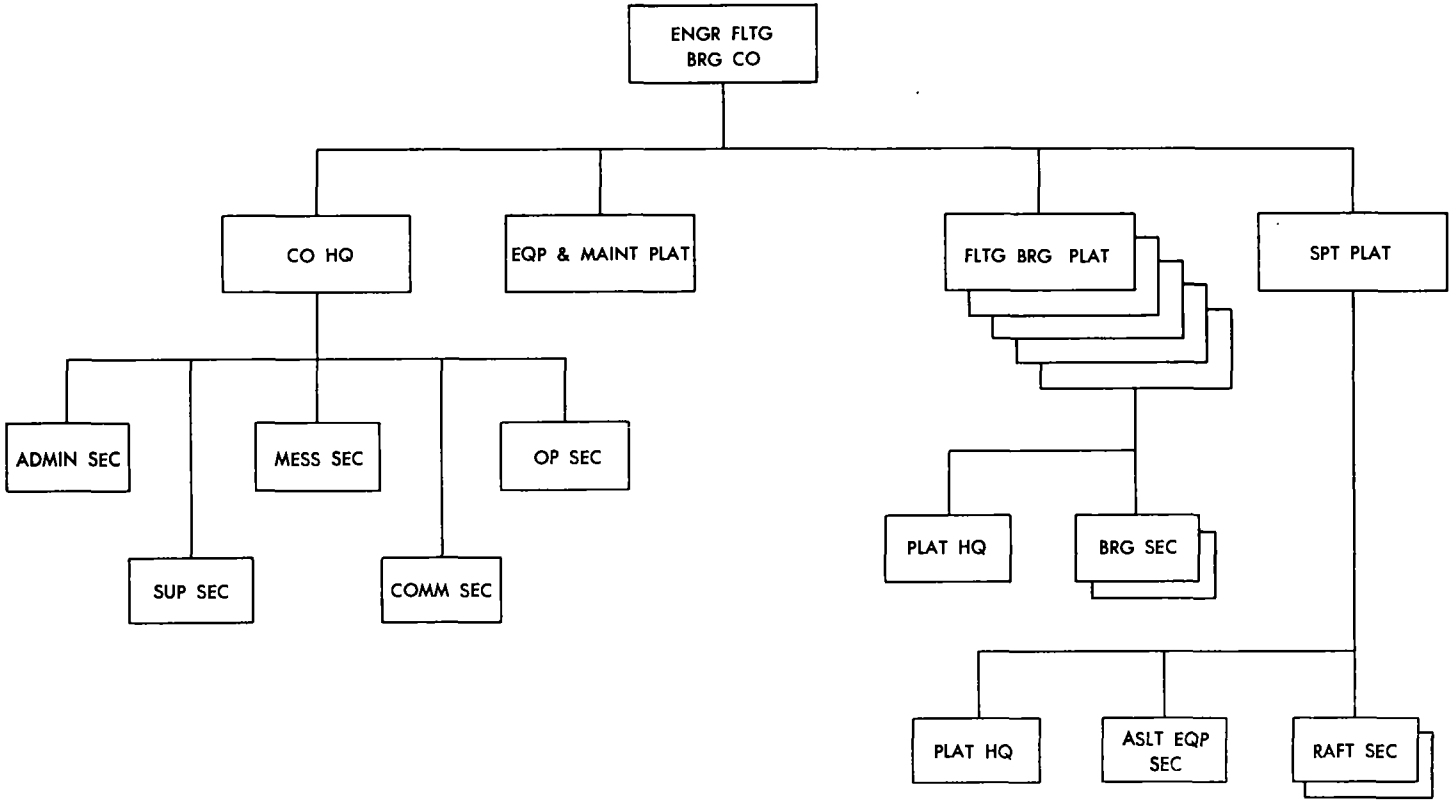

Figure 14. Organization chart, engineer float bridge company.

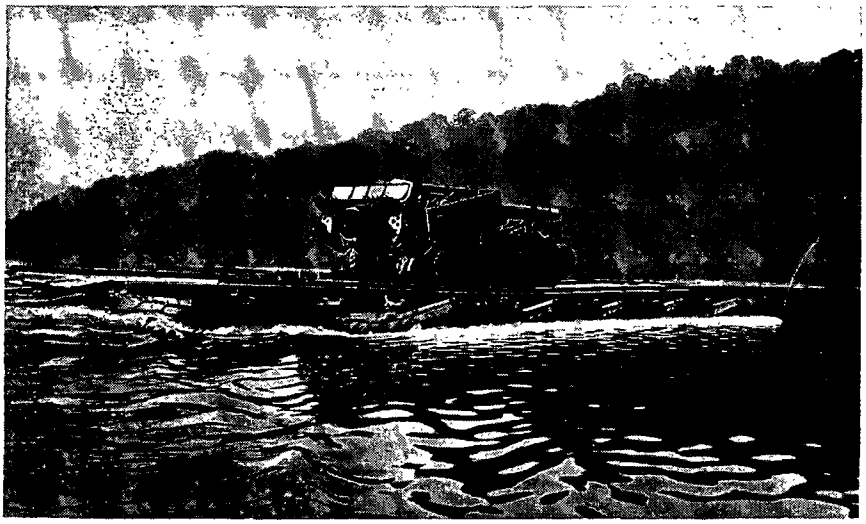

Figure 15. M4T6 five-float raft.

(4) Constructing bridges and rafts with its organic personnel in emergencies and at a reduced rate.
(5) Providing 5-ton and 2½-ton trucks for general cargo hauling by immobilizing its organic bridging.
(6) Performing organizational maintenance on its organic equipment.
(7) Maintaining installed float bridges.

b. The engineer float bridge company has a limited capability of defending itself against hostile ground attack.

Section II. METHOD OF OPERATION

62. Employment

a. Normally, the bridging and other crossing equipage is installed by elements of an engineer combat battalion, army, in support of divisional or corps operations. The float bridge company transports the equipage to the site of the crossing and furnishes technical assistance and additional erection equipment, with operators. For a crossing under division control, float bridge units may be attached to the divisional engineer battalion. In a deliberate river-crossing operation, the engineer portion of the entire project, including provision of the approach road net, is directed by the brigade commander, normally through an engineer combat group.

b. Additional bridging, when required, is transported by the company from an engineer supply point or depot.

c. The company is trained to install its own bridge and rafts;

and it may be called upon to do so in an emergency. However, the tactical situation usually requires completion of the bridge in a shorter time than can be achieved by the limited manpower and erection equipment of the company; and construction by an engineer combat unit is preferred.

d. The company may be required to maintain installed bridges and furnish bridge guards to prevent damage to the bridge.

e. The company also disassembles the bridge or rafts, makes necessary repairs, and transports the equipage to the site of the next crossing.

f. When the company is employed on a general cargo-hauling mission, it is not ready and capable of performing its primary mission because its equipage is offloaded. Reloading requires a substantial amount of time, and excellent loading plans and procedures must be formulated.

63. Administration

The company prepares and maintains its own reports and files, working closely with, and under the supervision of, the group administrative section and group adjutant. When the company is located in the proximity of group headquarters, its personnel records and files may be physically located in the group's administrative section, with the company's personnel administrative clerk maintaining them at group headquarters.

64. Supply

Normal supply procedures apply in the operation of the company. It has its own supply accounts with all technical services and supporting supply points.

65. Maintenance

The engineer float bridge company is responsible for organizational maintenance of all TOE equipment as well as organizational maintenance of its organic bridging. The echelon of maintenance is consistent with the spare parts authorization.

66. Communications

Radio facilities are provided for communication between sections of each platoon, between platoons, between the platoons and company, and between the company and higher headquarters (fig. 16). Telephone facilities are provided for communication between the company and each of its platoons and between the company and higher headquarters (fig. 17).

67. Training

a. The engineer float bridge company is responsible for training

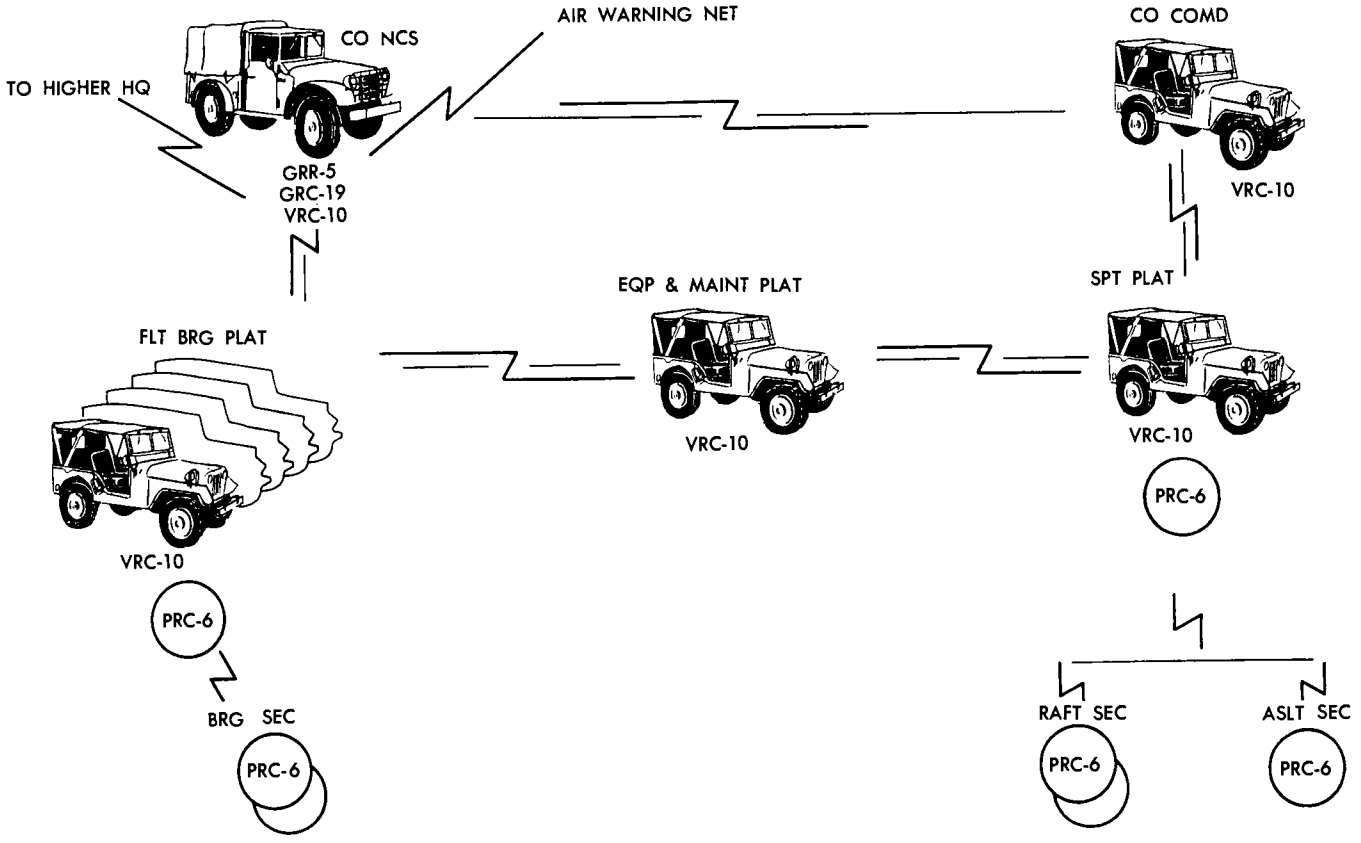

Figure 16. Radio net, engineer float bridge company.

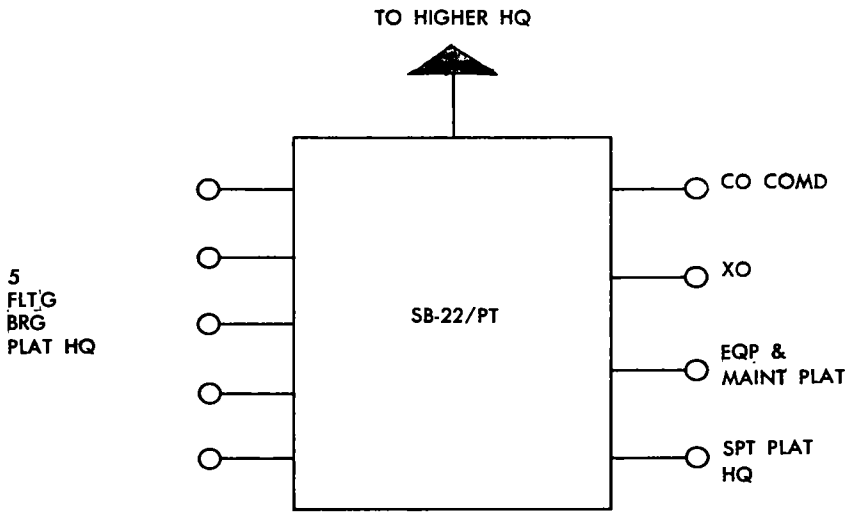

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Figure 17. Wire net, engineer float bridge company.

its personnel in accordance with ATP 5–5, and it assists other engineer units in training in the use of floating equipage organic to the company. When practical, a combined ATT with an engineer combat battalion provides a more realistic training objective.

b. The company headquarters supervises and supports all training within the company. At this level of command, the necessary cross-training of personnel is assured by on-the-job training and by specialist training conducted by service schools.

Section III. COMPANY HEADQUARTERS

68. Mission

The mission of the company headquarters of the engineer float bridge company is to provide command, administration, mess, supply, and communication support for the company.

69. Organization

The company headquarters includes the company commander, the executive officer, the first sergeant, a bridge sergeant, a mess steward, a supply sergeant, and other enlisted personnel to carry out the administration, mess, communication, and supply functions.

70. Equipment

The equipment of the company headquarters is outlined in TOE 5–78.

71. Employment and Operations

The company headquarters is normally employed as a unit to accomplish its mission of supporting the platoons. However, it is flexible enough to allow elements of it to work in widely dispersed areas for short periods of time in support of a specific mission.

72. Administration

Administration for the entire company is accomplished by the company headquarters. The platoons of the company are to be relieved, as far as possible, of all administrative responsibilities in order that they may participate in training or accomplish their assigned missions.

Section IV. EQUIPMENT AND MAINTENANCE PLATOON

73. Mission

The mission of the equipment and maintenance platoon is to provide heavy equipment and operators in support of the bridge platoons of the company. The unit also performs organizational maintenance and emergency repairs within its spare parts storage authorization.

74. Organization

The equipment and maintenance platoon contains a platoon leader, maintenance sergeants, mechanics, equipment operators, and drivers to accomplish its assigned mission.

75. Equipment

Major items of equipment for the equipment and maintenance platoon are—crane-shovels, trailer-mounted pneumatic tool and compressor outfits, a semitrailer repair parts van, a medium tractor, organizational and mechanic toolkits, fuel tank trucks, a medium wrecker, and a trailer-mounted welding shop.

76. Capabilities

The equipment and maintenance platoon is capable of—

a. Performing, directing, and supervising organizational maintenance, repair, and inspection of the float bridge company's vehicles and equipment.

b. Providing technical assistance to the bridge platoons in the use and capabilities of their equipment.

c. Providing heavy equipment to assist in bridge erection.

d. Training the company's subordinate units in the operation of equipment, and preventive and organizational maintenance of engineer equipment.

77. Employment

The equipment and maintenance platoon is normally employed as a unit to accomplish its mission. Repairs which can be accomplished by the platoon are usually done at the worksite. Elements of the platoon may be attached to the bridge platoons to assist in the construction of bridges and rafts.

Section V. FLOAT BRIDGE PLATOON

78. Mission

The float bridge platoon is the basic work unit of the engineer float bridge company and is responsible for transporting (fig. 18), maintaining, and assisting in the assembly of M4T6 float bridges and rafts.

79. Organization

Each of the five bridge platoons consists of a bridge platoon headquarters and two identical bridge sections.

80. Equipment

Major items of equipment of the float bridge platoon are bridge erection boats, one set of M4T6 floating bridge, 2½-ton cargo trucks, and 5-ton stake trucks.

81. Capabilities

The float bridge platoon is capable of:

a. Loading, transporting, and maintaining one set of M4T6 float bridge (fig. 19) approximately 150 feet in length, or two rafts, capable of carrying divisional loads.

b. Providing assistance to the engineer units that are constructing bridges or rafts or both.

c. In an emergency, actually constructing bridges and rafts at a reduced rate of construction.

82. Employment

The float bridge platoon is normally employed as a unit. For a river crossing under divisional control, float bridge units may be attached to a divisional engineer battalion. In a deliberate river crossing operation, the engineer portion of the entire project, including provision of the approach road net, is directed by the

brigade commander, normally through an engineer combat group. The total number of bridge sets required depends primarily on the width of the river to be crossed.

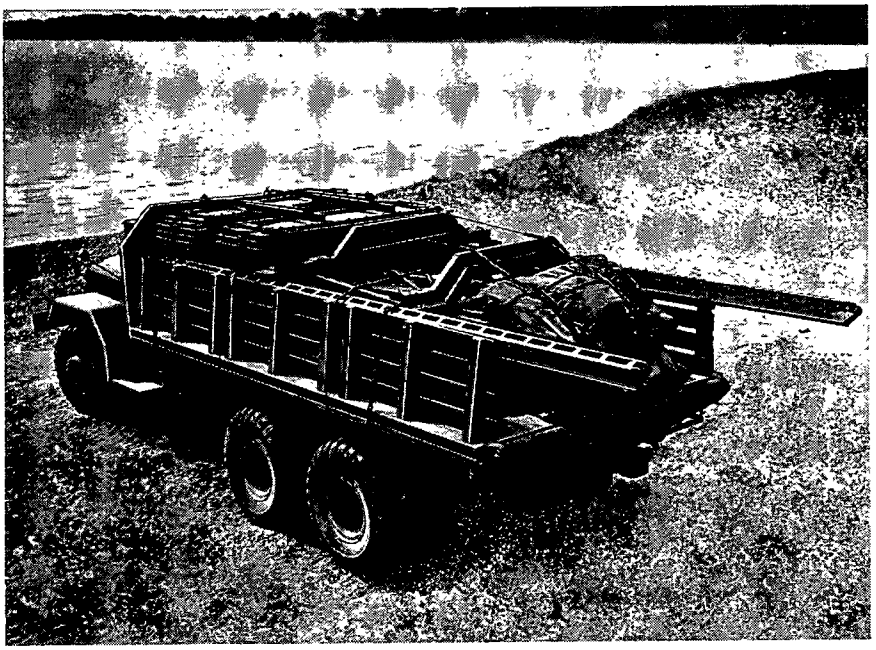


Figure 18. Truck loaded with M4T6 bridging.

Figure 19. Standard M4T6 floating bridge.

Section VI. SUPPORT PLATOON

83. Mission

The mission of the support platoon is to provide light stream-crossing equipage in support of a tactical river-crossing operation.

84. Organization

The support platoon consists of a support platoon headquarters, two identical raft sections, and an assault equipment section.

85. Equipment

Major items of equipment of the support platoon are: assault boats (inflation type, 15-man), a footbridge, light tactical floating rafts, outboard motors, and a 2½-ton cargo trucks.

86. Capabilities

The support platoon is capable of —

a. Providing approximately 470 feet of aluminum footbridge (fig. 20).

b. Providing six light tactical rafts which may be converted into a bridge, floating, raft, light tactical (fig. 21).

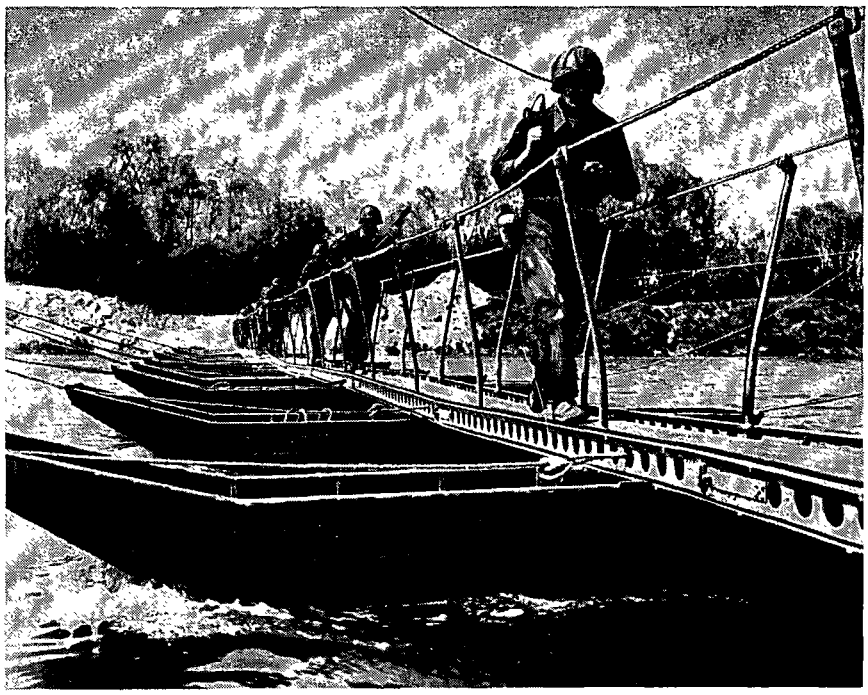


Figure 20. Infantry troops crossing a footbridge.

c. Rendering technical advice and assistance to an engineer unit responsible for the erection of the footbridge and light tactical rafts.

d. Supplying approximately 70 assault boats for a tactical river-crossing operation.

87. Employment

The support platoon is normally employed in the assault phase of a river-crossing operation.

Figure 21. Bridge, floating, raft, light tactical.

CHAPTER 7

ENGINEER PANEL BRIDGE COMPANY

Section I. CHARACTERISTICS

88. Mission

The mission of the panel bridge company is to provide personnel and equipment for loading, transporting, and maintaining panel bridging and to render technical assistance in the erection of the bridge. The panel bridge company may also carry out missions of a dump truck company for earth moving and cargo hauling.

89. Organization

The panel bridge company (fig. 22) consists of a company headquarters and two identical bridge platoons.

90. Mobility

The panel bridge company is 100 percent mobile. For air transportability, see FM 101–10.

91. Assignment

The normal assignment of the panel bridge company is to field army, two per corps area and six per army area.

92. Capabilities

a. The panel bridge company is capable of—

(1) Loading, transporting, and maintaining one bridge set consisting of the bridge erection equipment and components for two 80-foot, double-truss, single-story, widened-roadway, panel-type bridges, or one 130-foot, double-truss, double-story, panel-type bridge (fig. 23).

(2) Providing technical assistance for erecting the bridges.

(3) Erecting bridges, in an emergency, with organic personnel.

(4) Providing dump trucks for earth moving and general cargo hauling, with approximately 160-ton capacity per lift, when bridging is immobilized. However, when its bridging is immobilized the panel bridge company is not capable of performing its primary mission.

(5) Performing organizational maintenance on its equipment.

b. The engineer panel bridge company has a limited capability of defending itself against hostile ground attack.

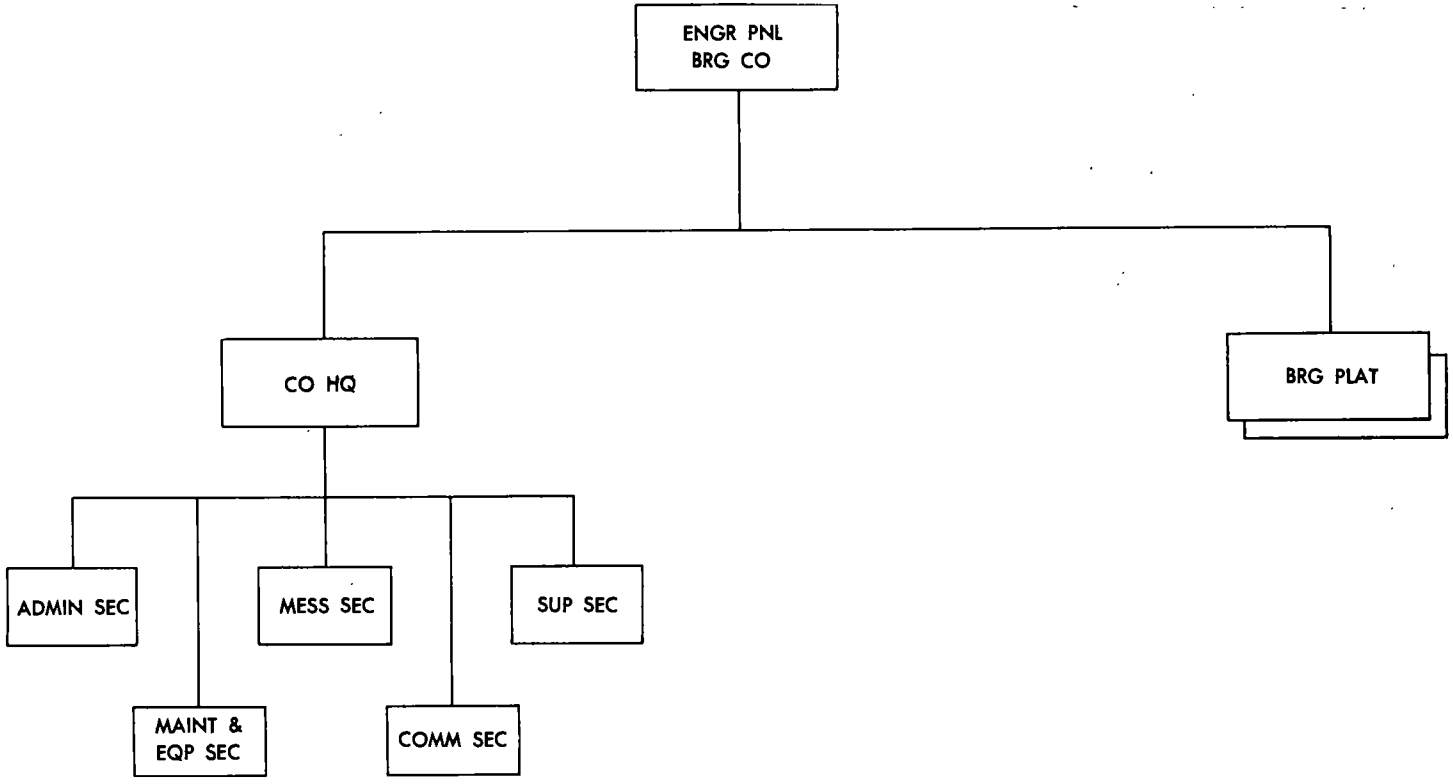


Figure 22. Organization chart, engineer panel bridge company.

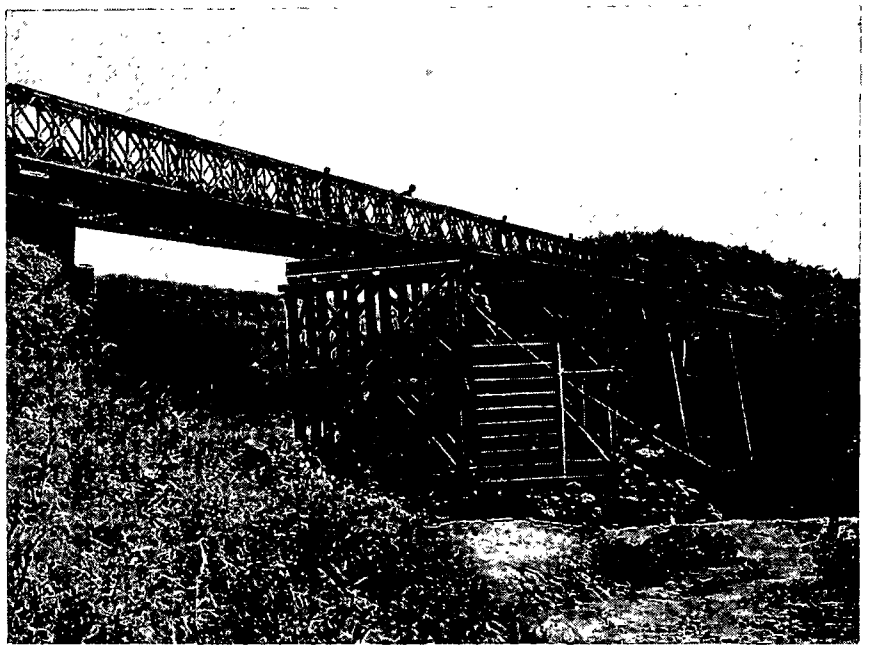


Figure 23. Panel bridge, Bailey type, M2, supported by intermediate supports.

Section II. METHOD OF OPERATION

93. Employment

a. Normally, the equipment provided by the company is erected by elements of the supported organization. The company transports the bridging to the site of the crossing and furnishes bridge specialists and supervisors to assist in its erection. For a large bridging operation, the entire project, including provision and preparation of the approach road net, is normally directed by an engineer combat group. The company may also be attached to an engineer combat battalion.

b. Additional bridging beyond the organic equipment of the company, when required, is transported by the company from an engineer supply point or depot.

c. The company is trained to erect its own bridging, and it may be called upon to do so in an emergency. However, the tactical situation usually requires completion of the bridge in a shorter time than can be achieved by the limited manpower of the company alone.

d. The company may be required to furnish bridge guards and to maintain erected bridging.

e. The company normally procures a new load of bridging as its organic load is used in operations. Other companies in the rear

may later disassemble the bridge and return its components to depot stock.

f. When the situation warrants, the group commander may direct the company to unload its bridging and utilize the dump trucks for hauling bulk construction materials. Where possible, bridge loads should be palletized to expedite this operation. The company can be effectively employed by giving it mission type task assignments, rather than attaching it or a portion of it to a combat battalion. The company has sufficient supervisors and equipment; and it can be further augmented with similar equipment and operators from the light equipment company. The company can be given a mission of operating a borrow pit and delivering material in place to a combat engineer battalion.

94. Administration

The company prepares and maintains its own reports and files, working closely with, and under the supervision of, the group administrative section and group adjutant. When the company is located in the proximity of group headquarters, its personnel records and files may be physically located in the group's administrative section, with the company's personnel administrative clerk maintaining them at group headquarters.

95. Supply

The panel bridge company requisitions, stores, and issues its authorized supplies, equipment, and repair parts. It has its own supply accounts with all technical services and supporting supply points.

96. Maintenance

The panel bridge company performs first and second echelon maintenance on its vehicles and engineer equipment.

97. Communications

Radio facilities are provided for operation of internal communications and for communicating with higher headquarters and supported units (fig. 24). Standard field telephone and wire equipment is furnished to provide wire communications between the company and higher headquarters and between the company and the bridge platoons (fig. 25).

98. Training

The engineer training of the panel bridge company is conducted by the company; however, since the company is attached to an engineer group, the training is coordinated with group head-

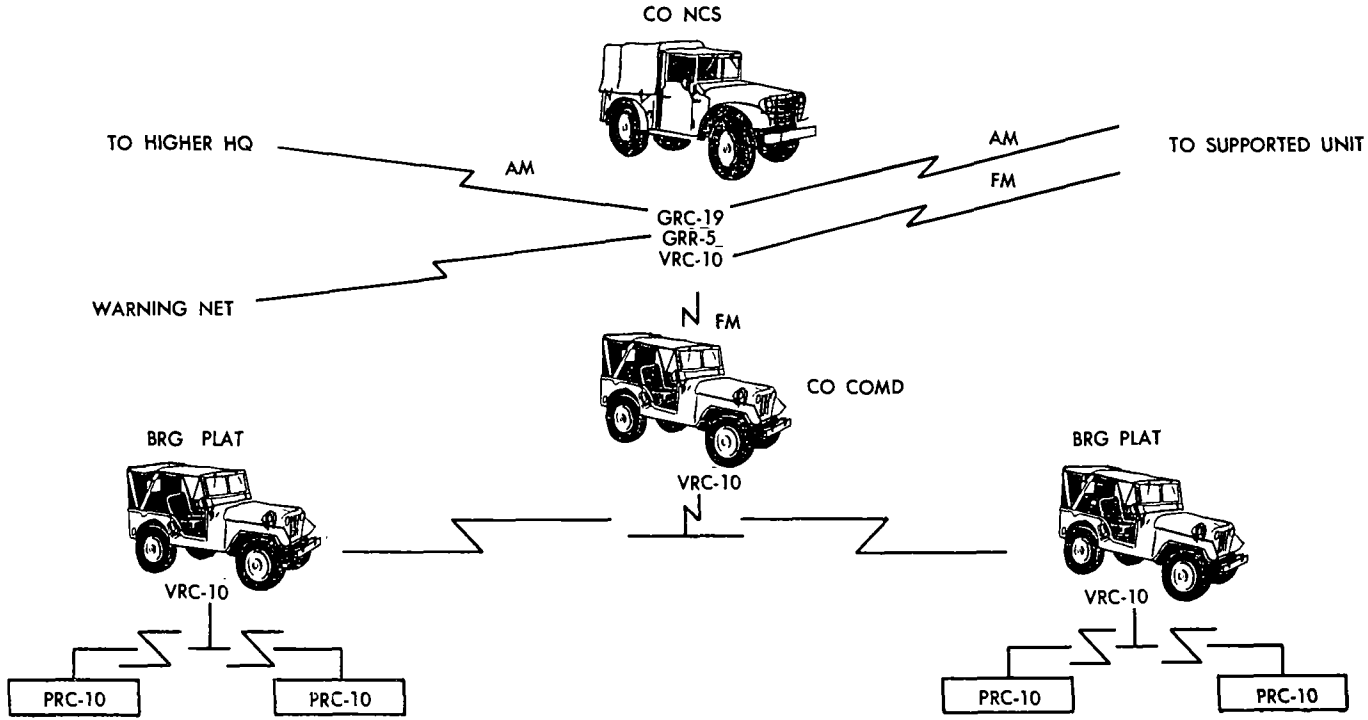
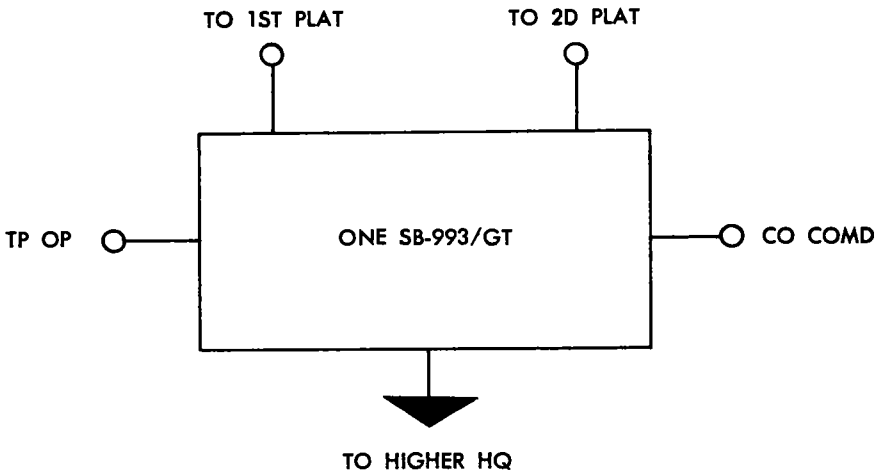


Figure 24. Radio net, engineer panel bridge company.

quarters (ATP 5–5). Specialist training may be conducted by the platoon in sections supervised by the platoon leader or section head. Every opportunity should be taken to utilize school quotas for specialist training. The company may assist in training other units in the erection of the bridge.



O—TELEPHONE, TA-312/PT

Figure 25. Wire net, engineer panel bridge company.

Section III. COMPANY HEADQUARTERS

99. Mission

The mission of the company headquarters is to provide command, administration, mess, supply, and maintenance functions for the panel bridge company.

100. Organization

The company headquarters consists of a command element, an administrative element, a supply section, a mess section, a communication section, and a maintenance and equipment section.

101. Equipment

Major items of equipment in company headquarters are—one bridge set consisting of bridge erection equipment and components for two 80-foot, double-truss, single-story, panel type bridges; a medium tractor with angledozer blade; organizational and mechanic tool kits; 5-ton dump trucks; a medium wrecker; and a trailer-mounted welding shop.

102. Employment and Operations

The company headquarters is normally employed as a unit to accomplish its mission of supporting the platoons. However, it is flexible enough to allow its elements to work in widely dispersed areas for short periods of time in support of a specific mission. The bridge assigned to company headquarters is carried on the platoon vehicles.

103. Administration

Administration for the entire company is accomplished by the company headquarters, relieving the platoons of the responsibility in order that they may accomplish their assigned missions.

Section IV. BRIDGE PLATOON

104. Mission

The bridge platoon is the basic work unit of the panel bridge company. Its mission is to load, transport, and maintain one 80-foot, double-truss, single-story, panel type bridge and to provide technical assistance for its erection.

105. Organization

The bridge platoon consists of a platoon leader, a bridge supervisor, bridge foremen, assistant bridge foremen, crane-shovel operators, bridge specialists, bridge helpers, a light-truck driver, and a low-speed radio operator. The bridge platoon is assigned on the basis of two per panel bridge company.

106. Equipment

Major items of equipment in the bridge platoon are: a crane shovel, 2½-ton utility trailers, and 5-ton dump trucks.

107. Capabilities

The bridge platoon is capable of the following:

a. Transporting one 80-foot, double-truss, single-story, panel type bridge and providing technical assistance for its erection.

b. Providing a hauling capacity of fourteen 5-ton dump trucks by immobilizing the bridge. However, with the bridge immobilized the platoon cannot perform its primary mission.

c. Defending its worksite against hostile ground attack.

108. Employment

The normal employment of the bridge platoon is to transport the panel bridging to the worksite and then supervise its erection by the engineer troops assigned the task (fig. 26). The platoon

can erect its own panel bridge with its organic personnel; but the task will be accomplished at a reduced rate. This type employment should be avoided except in emergencies.

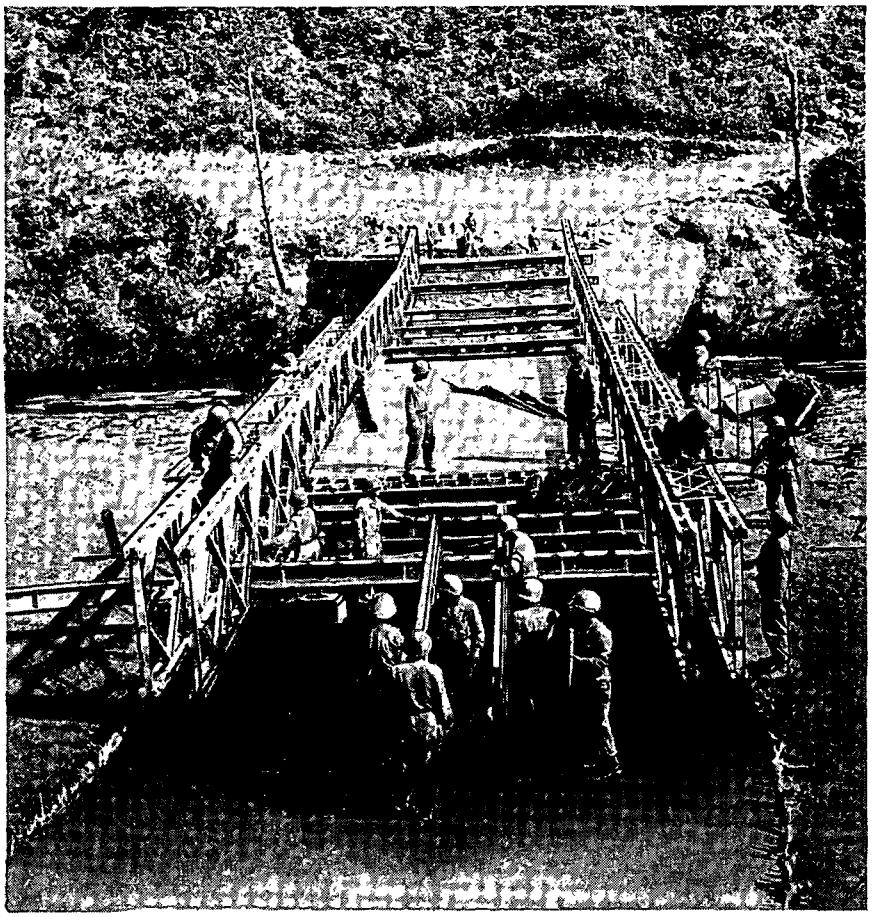


Figure 26. Engineers constructing a Bailey bridge.

CHAPTER 8

ENGINEER LIGHT EQUIPMENT COMPANY

Section I. CHARACTERISTICS

109. Mission

a. The mission of the engineer light equipment company is to operate and maintain a concentration of construction equipment in support of engineer combat units.

b. The mission of the engineer light equipment company, airborne, is to operate and maintain a concentration of construction equipment to assist the airborne division engineer battalion in the construction of airstrips within the airhead, and subsequently, to provide engineer construction equipment support for engineer tasks.

110. Organization

The engineer light equipment company and the engineer light equipment company, airborne (fig. 27), consist of a company headquarters, three equipment platoons, and a maintenance and support platoon.

111. Equipment

The major items of equipment in the engineer light equipment company and the light equipment company, airborne, are listed in the applicable TOE's.

112. Mobility

a. The light equipment company is 100 percent mobile. For air transportability, see FM 101–10.

b. The light equipment company, airborne, is 100 percent mobile and air transportable.

113. Assignment

a. The engineer light equipment company is assigned to army with normal attachment to an engineer combat group. The allocation is normally two per corps and three per army area.

b. The engineer light equipment company, airborne, is assigned to army with normal further assignment to an airborne corps.

114. Capabilities

a. The engineer light equipment company is capable of—

(1) Operating in support of three engineer combat battalions, army, engaged in general engineer work.

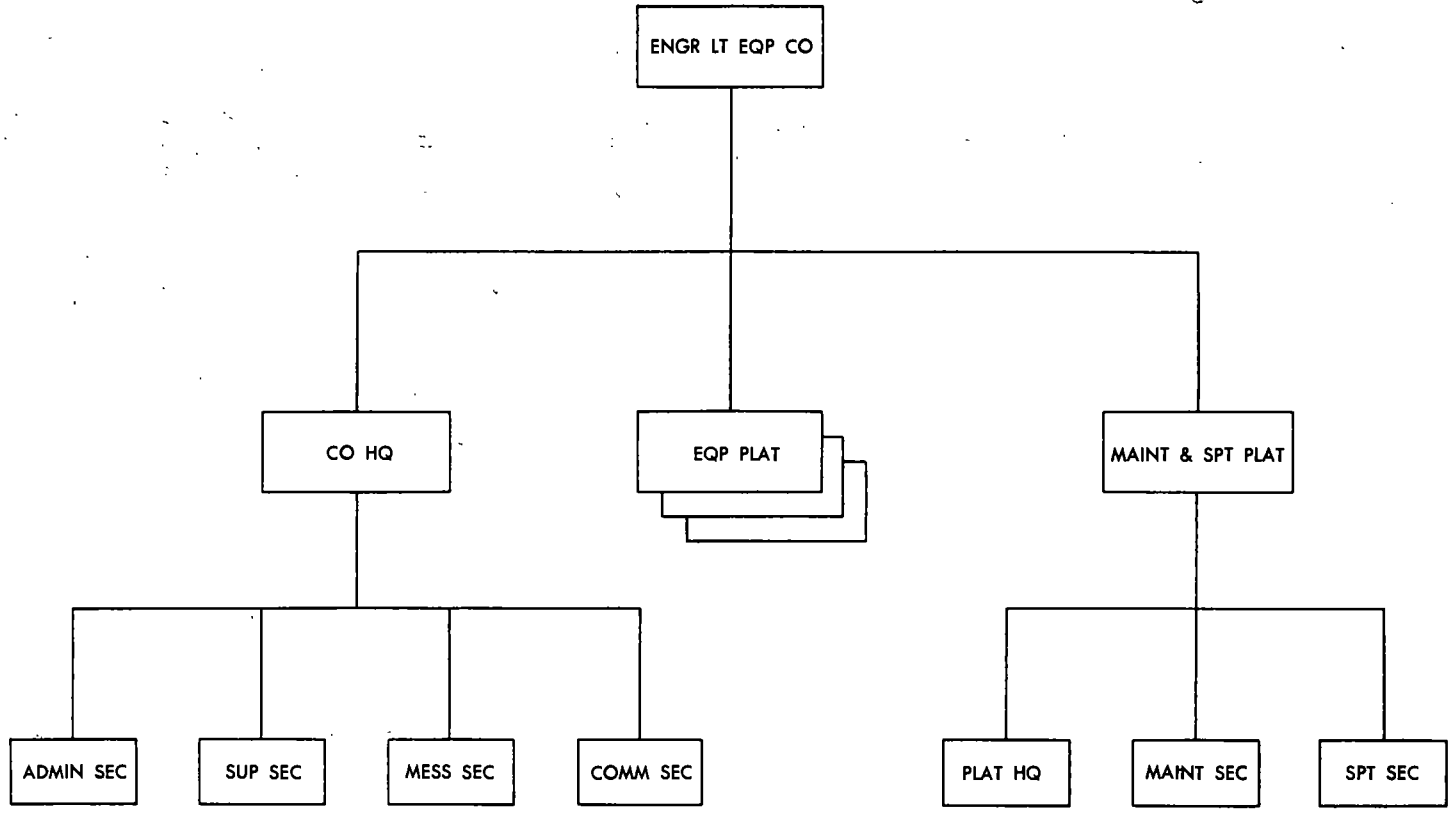


Figure 27. Organization chart, engineer light equipment company and engineer light equipment company, airborne.

(2) Providing additional equipment support, when required, for divisional engineers.

(3) Providing two-shift operation of construction equipment.

(4) Providing organizational maintenance of organic equipment.

b. The engineer light equipment company, when organized as an airborne company, is capable of the following:

(1) In airborne operations, it can be delivered by parachute or assault aircraft, or both.

(2) It can augment the airborne division engineer battalion's airstrip construction effort by providing a concentration of specialized construction equipment.

(3) When relieved of airstrip construction, it can provide construction equipment support for other engineer tasks.

(4) It provides organizational maintenance of organic equipment.

c. The engineer light equipment company has a limited capability of defending itself against hostile ground attack.

Section II. METHOD OF OPERATION

115. Employment

a. The engineer light equipment company is normally employed by having its equipment platoons attached to engineer combat battalions and divisional engineer battalions for specific missions. Individual items of equipment from the light equipment company may also be attached to the battalions and divisional engineer battalions or separate units of the group for specific missions.

b. The company is usually located in the vicinity of group headquarters.

116. Administration

a. The company prepares and maintains its own reports and files, working closely with, and under the supervision of, the group administration section and group adjutant. When the company is located in the proximity of group headquarters, its personnel records and files may be physically located in the group's administrative section, with the company's personnel administrative clerk maintaining them at group headquarters.

b. The engineer light equipment company, airborne, performs the administration for its organic elements. It prepares and maintains its own reports, records, and files.

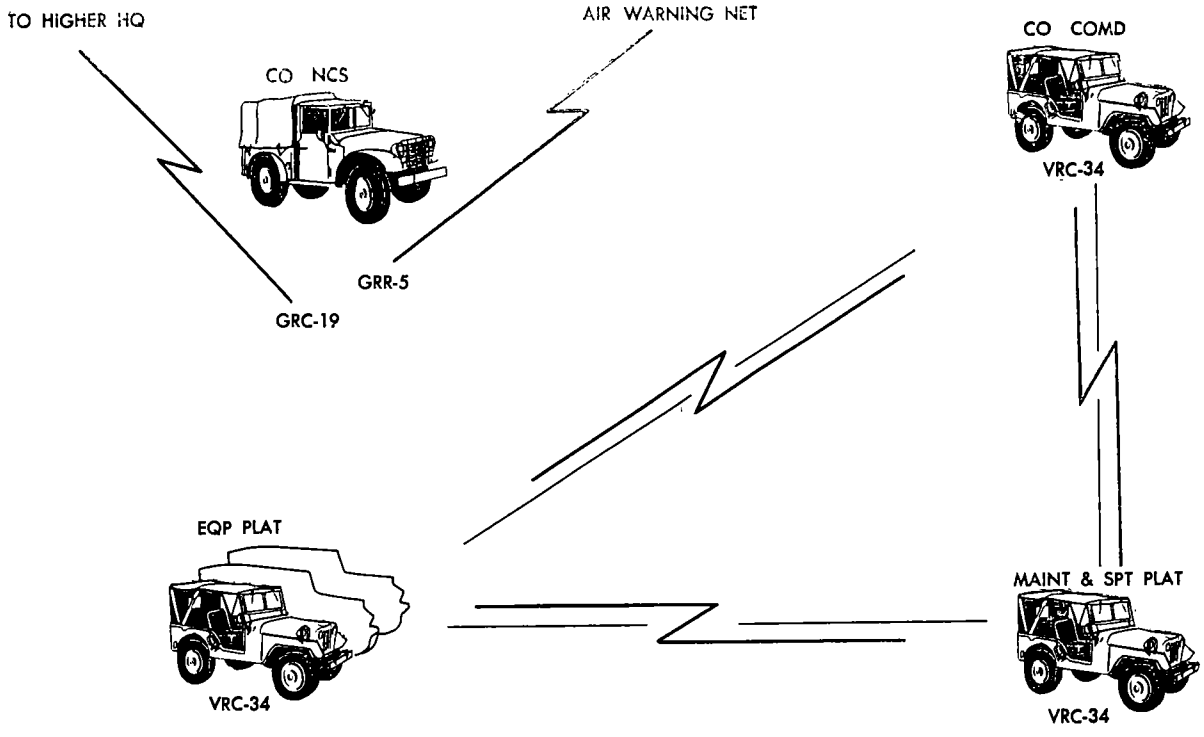


Figure 28. Radio net, engineer light equipment company.

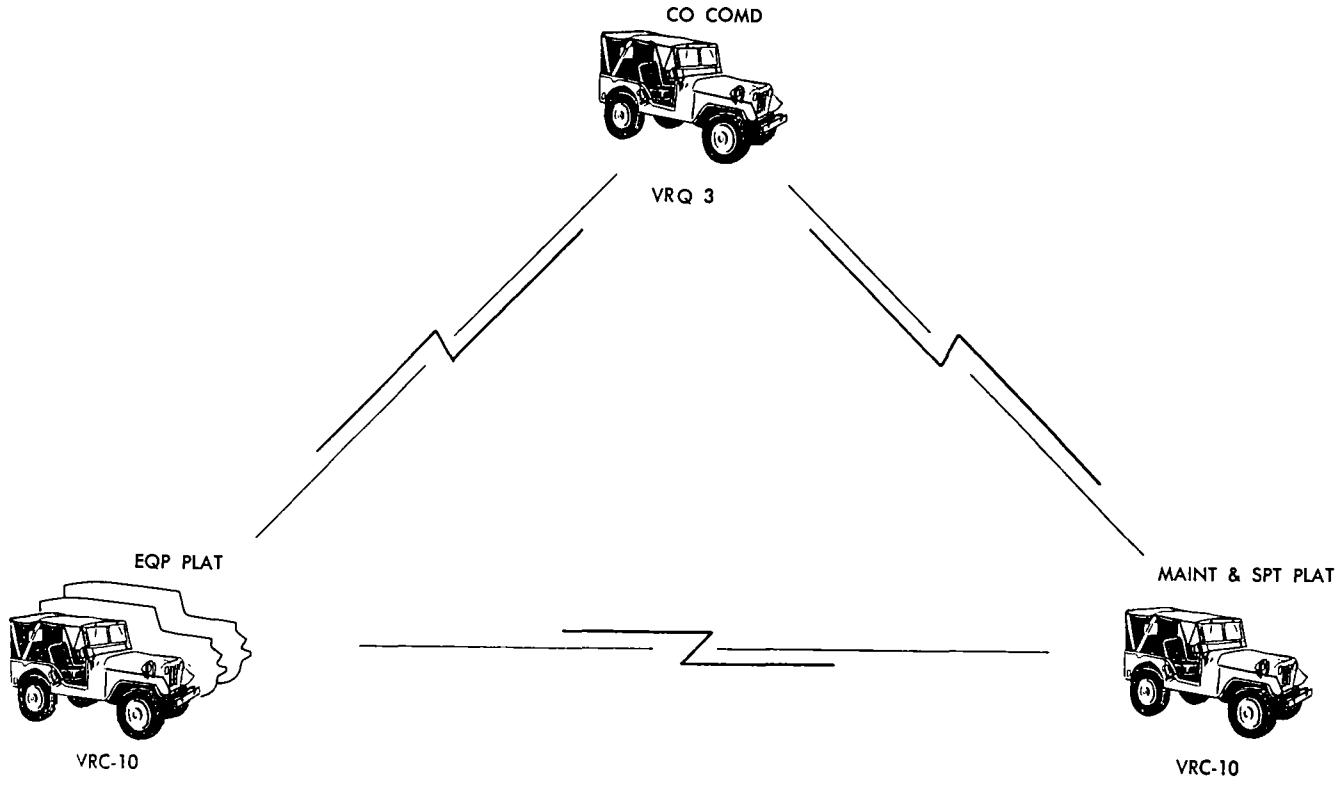
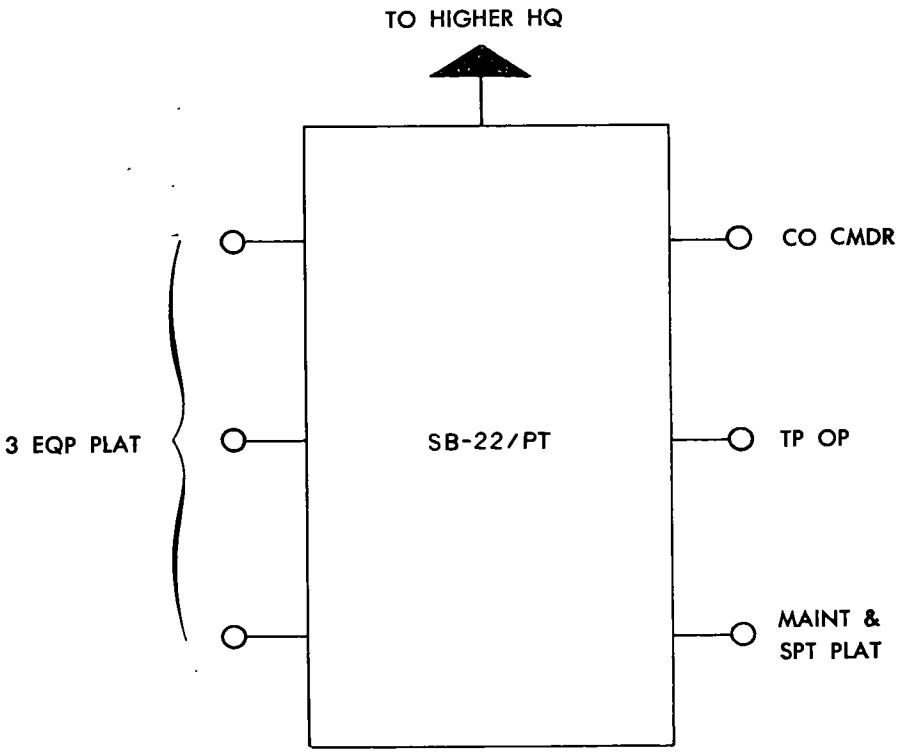


Figure 29. Radio net, engineer light equipment company, airborne.



O—TELEPHONE SET, TA-312/PT

Figure 30. Wire net, engineer light equipment company and engineer light equipment company, airborne.

117. Supply

The engineer light equipment company provides its organic supply service. The company maintains supply accounts with all technical services and appropriate supply points.

118. Maintenance

The engineer light equipment company performs its own organizational maintenance on equipment, consistent with its spare parts authorization. However, when attached, elements of the company receive organizational maintenance support from the supported organization.

119. Communications

a. In the engineer light equipment company, radio facilities are provided for communication between the company and higher

headquarters and between the company and each of its platoons (fig. 28).

b. In the engineer light equipment company, airborne, radios are provided for communication between the company and each of its platoons (fig. 29).

c. Both the engineer light equipment company and the engineer light equipment company, airborne, provide telephone communication between company and platoons (fig. 30) and between the company and higher headquarters.

120. Training

Training is supervised by the company commander, in accordance with training policies and directives of group headquarters (ATP 5–5). Emphasis is placed on cross-training of all equipment operators.

Section III. COMPANY HEADQUARTERS

121. Mission

The mission of the company headquarters is to provide the command, administration, mess, supply, and communication functions for the company.

122. Organization

The company headquarters consists of the command element, administration section, supply section, mess section, and communication section. In addition to these sections, there is an operation section, when the company is organized as an engineer light equipment company, airborne.

123. Equipment

Items of equipment are listed in TOE 5–54.

124. Employment and Operations

The company headquarters is normally employed as a unit to accomplish its mission of supporting the platoons. However, it is flexible enough to allow its elements to work in widely dispersed areas for short periods of time in support of a specific mission.

125. Administration

The company headquarters provides administration for the company, relieving the platoons of the responsibility in order that they may accomplish their assigned missions.

Section IV. EQUIPMENT PLATOON

126. Mission

The mission of the equipment platoon is to supply a concentration of engineer equipment, with operators, in support of engineer units.

127. Organization

a. Engineer Light Equipment Platoon. The equipment platoon consists of a platoon leader, a platoon sergeant, an assistant platoon sergeant, crane shovel operators, grader operators, tractor operators, air compressor operators, an intrenching machine operator, truck drivers, a construction machine helper, a loader operator, and a low-speed radio operator.

b. Engineer Light Equipment Platoon, Airborne. The airborne equipment platoon consists of a platoon leader, a construction machine supervisor, an assistant construction machine supervisor, grader operators, tractor operators, air compressor operators, a loader operator, and truck drivers.

128. Equipment

a. Engineer Light Equipment Platoon. Major items of equipment in the equipment platoon are—a truck-mounted crane-shovel, motorized road graders, a high-speed intrenching machine, a scoop loader, a trailer-mounted pneumatic tool and compressor outfit, a sheepsfoot roller, a rooter, 12-cubic-yard towed scrapers, medium tractors with angledozer blades, a heavy tractor with bulldozer blade, a wheeled tractor with bulldozer blade, and 5-ton dump trucks.

b. Engineer Light Equipment Platoon, Airborne. Major items of equipment in the equipment platoon, airborne, are—an air transportable motorized road grader, scoop loaders, 7½-cubic-yard towed scrapers, airtransportable tractors with bulldozer scarifiers, a trailer-mounted pneumatic tool and compressor outfit, and 2½-ton dump trucks.

129. Capabilities

a. The equipment platoon is capable of—

(1) Furnishing engineer construction equipment, with operators, to engineer combat battalion, army, and divisional engineer battalion as required. One of the new items now organic to the platoon is the 2½-cubic-yard front loader (fig. 31).

(2) Maintaining a two-shift operation of construction equipment.

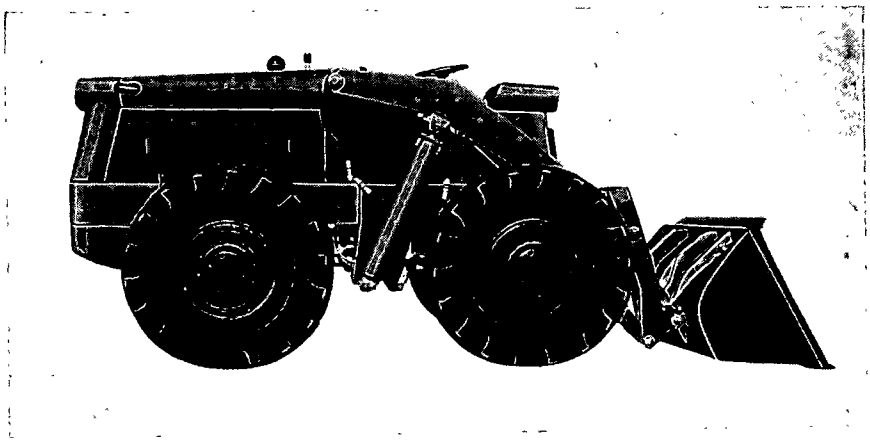


Figure 31. Two-and-one-half-cubic-yard front loader.

(3) Operator maintenance of its organic engineer equipment.

b. In addition to the above capabilities, it is capable of being delivered by parachute or assault aircraft into an airhead when it is organized as an engineer light equipment platoon, airborne.

130. Employment

The equipment platoon normally is attached to an engineer combat unit for a specific mission. Individual engineer equipment can be furnished also for specific missions in which the supported unit needs additional capabilities.

Section V. MAINTENANCE AND SUPPORT PLATOON

131. Mission

a. The mission of the maintenance and support platoon is to provide a concentration of specialized construction equipment.

b. It performs organizational maintenance on all engineer and ordnance equipment within the company, consistent with the spare parts authorization.

132. Organization

The maintenance and support platoon consists of a support section and a maintenance section.

133. Equipment

a. Maintenance and Support Platoon, Light Equipment Company. The major items of equipment in the maintenance and support platoon are: a skid-mounted earth auger, crawler-mounted crane-shovels, a truck-mounted crane-shovel, a 25-cubic-yard crushing and screening plant, a truck-mounted bituminous

distributor, a truck-mounted water distributor, trailer-mounted bituminous heating kettles, a scoop loader, a 16-cubic-foot concrete mixer, pneumatic tool outfits, rock-drilling equipment sets, a 3-wheeled 10-ton motorized roller, a 13-wheeled towed roller, a semitrailer repair parts van, an organizational repair shop truck, contact maintenance shop trucks, a medium tractor with angle-dozer, organizational and mechanic tool kits, dump trucks, gasoline tankers, a medium wrecker, and a trailer-mounted welding shop.

b. Maintenance and Support Platoon, Light Equipment Company, Airborne. The major items of equipment in the maintenance and support platoon are—⅜-cubic-yard crane-shovels, a 15-ton-per-hour wheel-mounted crusher, scoop loaders, pneumatic tool and compressor outfits, sheepsfoot rollers, pneumatic-tired towed rollers, an organizational repair shop truck, contact maintenance shop trucks, organizational and mechanic tool kits, 5-ton dump trucks, gasoline tankers, a medium wrecker, and a trailer-mounted welding shop.

134. Capabilities

The maintenance and support platoon is capable of—

a. Providing organizational maintenance for organic equipment and vehicles of the engineer light equipment company.

b. Providing specialized construction equipment, with operators, to support the operations of units listed below, thereby giving them additional capabilities—

(1) Equipment platoons of the company.

(2) Other units within the engineer combat group.

(3) Divisional engineer units.

c. Providing equipment and operator support to a quarry and crusher operation (fig. 32).

d. Conducting a two-shift operation of construction equipment.

135. Employment

a. Support Section. Normally, elements of the support section of the maintenance and support platoons are attached to the equipment platoons of the company, which are further attached to other organizations. Occasionally, specific items of the section are attached to other organizations for specialized tasks and upon completion are immediately returned to the company.

b. Maintenance Section. The maintenance section of the maintenance and support platoon performs organizational maintenance on all engineer and ordnance equipment which is under the immediate control of the company commander. The supported organization is responsible for organizational maintenance on any

equipment on attached status from the company. However, the maintenance section, by frequent inspections, will insure that all equipment attached to other organizations is receiving proper maintenance and will provide assistance where necessary.

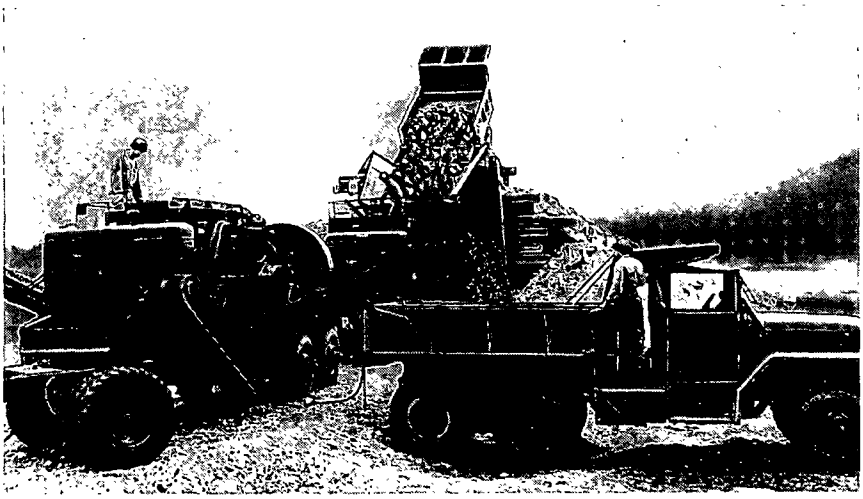


Figure 32. Crusher in operation (25-cu-yd unit).

CHAPTER 9

ENGINEER DUMP TRUCK COMPANY

136. Employment

a. The engineer dump truck company (fig. 33) is discussed fully in FM 5–162, *Engineer Construction and Construction Support Units*; however, it is discussed briefly here because it is frequently attached to the engineer combat group for movement of bulk materials in support of other engineer units in army and corps areas.

b. The dump truck company is usually located near the headquarters of the engineer combat group.

137. Capabilities

The dump truck company can move bulk material over established roads, although limited cross country capability is inherent in its equipment. It can transport construction and fortification materials, demolitions, and other general cargo not requiring cover, if the supported units provide loading and unloading equipment and personnel. It has a limited capability of defending itself against hostile ground attack. The company is also capable of performing organizational maintenance on its automotive equipment.

138. Communications

Radio equipment is provided for communication between the company and the dump truck platoons and between the company and higher headquarters (fig. 34); telephone and wire equipment is provided for communication between the company and higher headquarters, between the company and the service section, and between the company and each of the dump truck platoons (fig. 35).

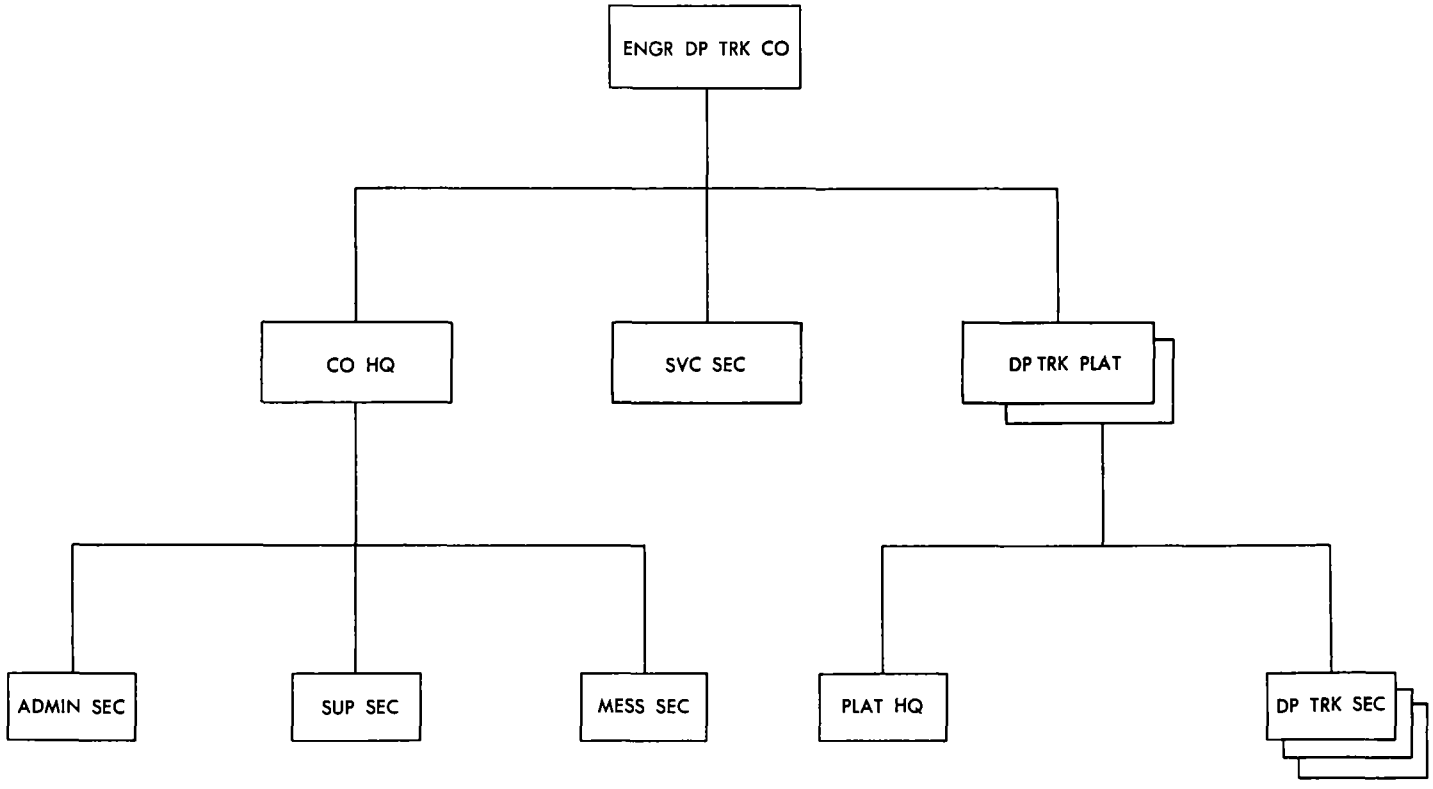


Figure 33. Organization chart, engineer dump truck company.

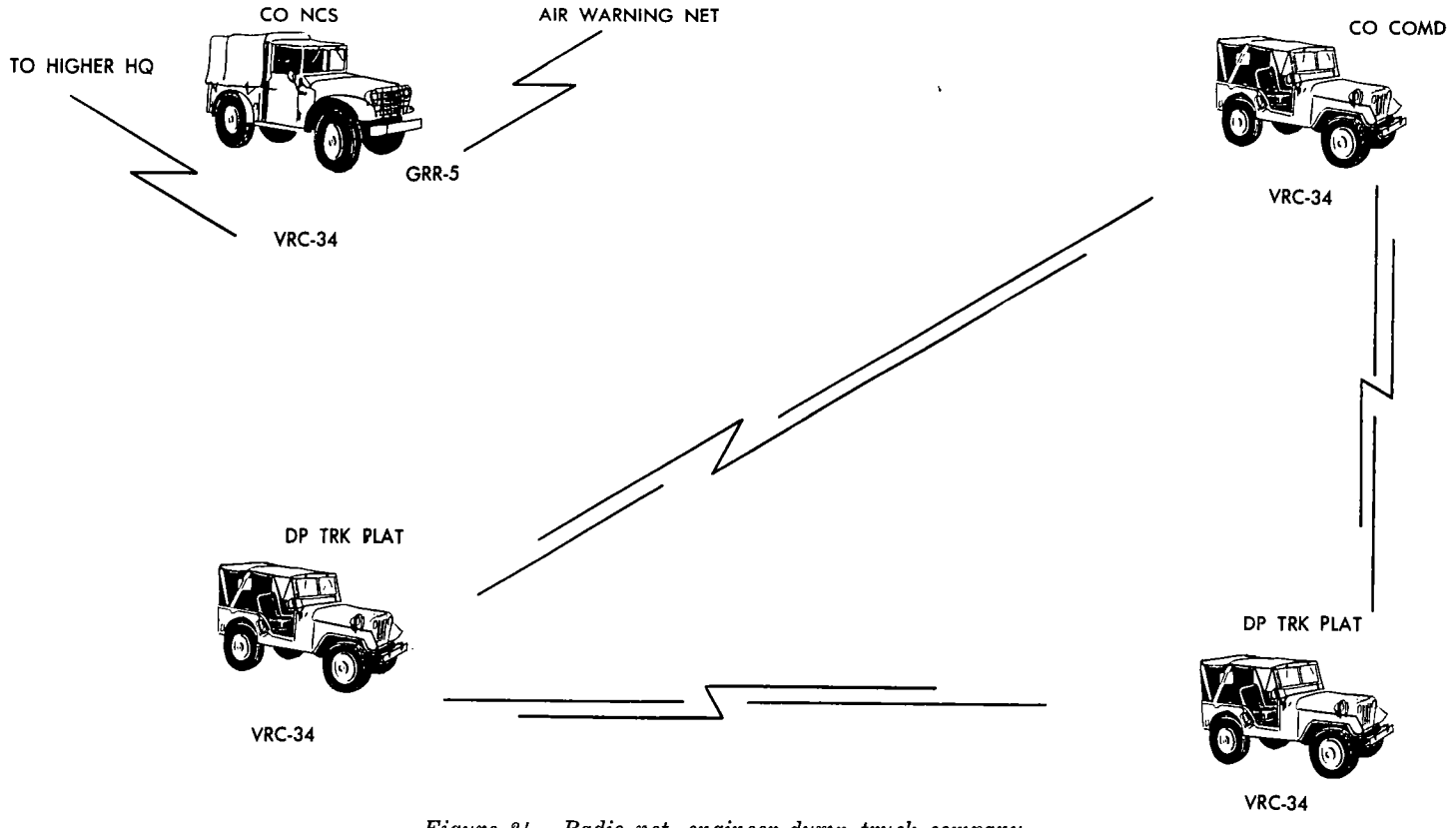


Figure 34. Radio net, engineer dump truck company.

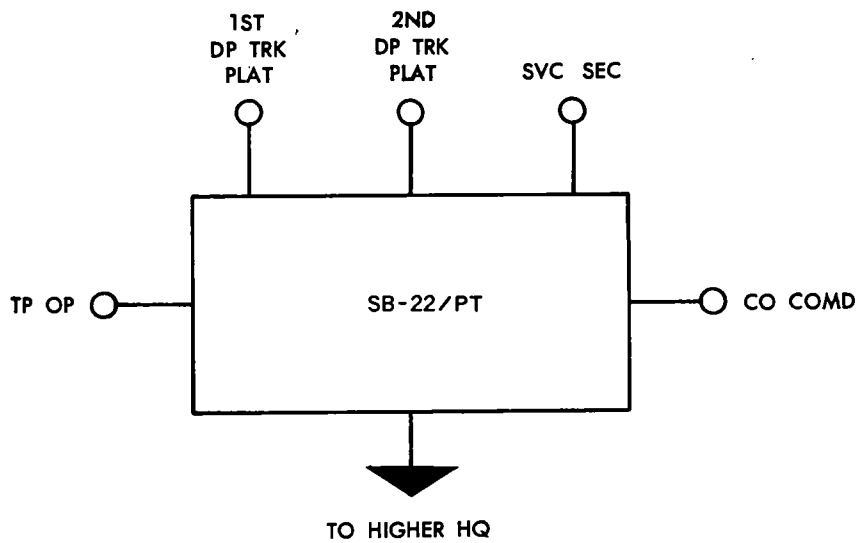


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Figure 35. Wire net, engineer dump truck company.

CHAPTER 10
OPERATIONS

Section I. GENERAL

139. Combat Engineer Units of a Typical Field Army

A fixed organization is not prescribed for the field army. However, for discussion in this chapter a type field army is considered having three corps consisting of three infantry divisions and one armored division each. In addition to the organic divisional engineer battalions, the engineer combat units in a type field army vary, depending upon the requirements for combat engineer troops to support tactical operations. Figure 1 shows a disposition of nondivisional engineer combat units in a typical field army. Engineer organizational and operational concepts of the nondivisional engineer combat units are designed for maximum operational flexibility and to support the field army in a nuclear or nonnuclear general or limited war. In general, the requirements of a corps or army for nondivisional engineer combat units are more closely related to the size and characteristics of the area and to the nature of the engineer tasks to be performed than they are to the number of personnel and equipment to be supported or to the organizational structure of corps or army.

140. Corps Area

a. Mission. Corps engineer operations render direct support to division engineer units and assist nondivisional troops of the corps. Corps engineer units are employed to supplement the engineer effort of divisions without regard to division rear boundaries and to take over a large proportion of the engineer tasks in division rear areas, thus freeing the division engineer to concentrate division engineer effort in forward areas (fig. 36). Operations of corps engineer units are characterized by a greater degree of permanency than division engineer operations.

b. Methods of Employment.

(1) Corps engineer troops may be employed on task assignments, area assignments, or a combination of both. The usual method is for the brigade commander to assign each engineer combat group a portion of the corps sector and to assign the group commander responsibility for all engineer work within the area assigned. Since the type corps normally has three divisions on line, it is possible that one group be placed in support of each committed

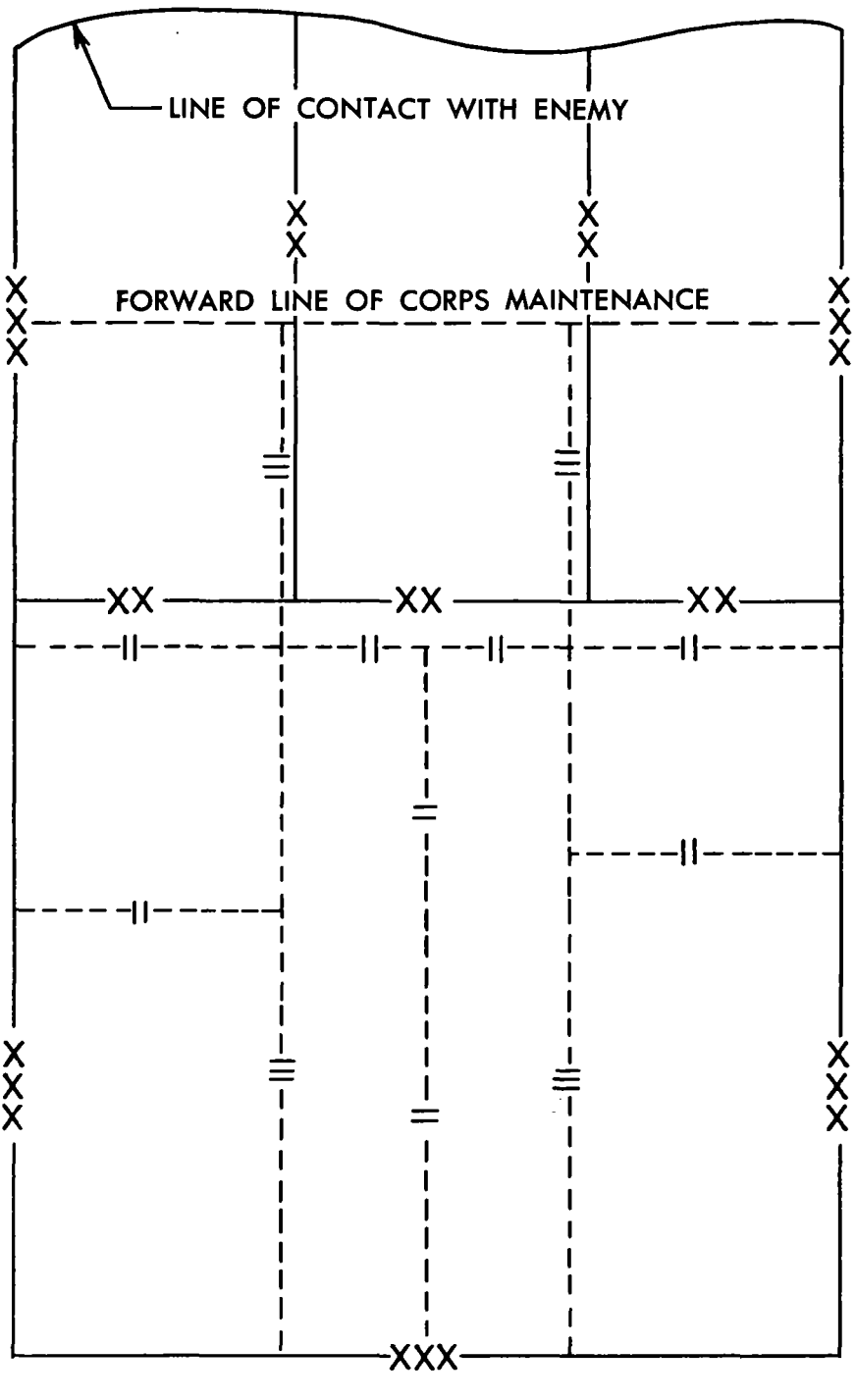

Figure 36. Typical corps area divided into combat group support.

division. If this does not require its entire effort, the group will assign additional work to its elements in the corps service area. The division engineer and the battalion or group commander, as the case may be, will mutually agree on work to be performed by the corps unit. Usually, a line will be established in the division zone, the divisional battalion doing all work forward of the line and the corps unit all work in the rear of the line (fig. 36). Corps units are not usually attached to divisions unless the division is on an independent mission or the engineer group commander cannot adequately control its operations.

(2) Areas for assignment of engineer responsibilities may be divided laterally or longitudinally for groups, depending upon the particular situation. The assignment of areas to battalions within the groups may also be made by boundaries generally perpendicular to the front or by boundaries parallel to the front. Placing the battalions abreast allows better control and places each battalion in a position where it can take over work in the service area of the echelon to its front. On the other hand, having the battalions disposed in column and leapfrogging them has the advantage of keeping a unit in the same area for the maximum length of time.

(3) The following factors should be considered in assigning areas to units for engineer work:

(*a*) The mission.

(*b*) The road net.

(*c*) The amount of engineer work in the designated area.

(*d*) The amount of interference from the enemy and from congestion of roads and other activities of friendly troops.

(*e*) The ease of communication and control. An area roughly square in shape makes control more simple than does one which is long and narrow.

(*f*) The strength of engineer units available.

(*g*) The amount and condition of heavy equipment.

(*h*) The tactical situation.

141. Army Area

a. Mission. Army engineer operations support corps operations in the same manner as corps support division. At division and corps level, the emphasis of engineer effort is placed on the support of operational plans. At army level, engineer operations

place emphasis on the development of facilities which provide long-term logistical support.

b. Methods of Employment.

(1) Generally, area assignment missions are given to army nondivisional engineer combat units. However, task assignments or a combination of both types of missions may be given. The army brigade engineer exercises command and supervision over the operations of engineer combat support units in the army area.

(2) Normally, one army engineer combat group is placed in support of each corps. The group has an area assignment and is responsible for general engineer work in its area of responsibility. The groups will usually suballot areas of responsibility to the engineer battalions and assign them appropriate missions.

142. Liaison

The establishment of liaison with the unit supported is absolutely vital for successful engineer operations. This liaison may be with other engineers or with personnel from other arms. Liaison is the responsibility of both parties, but the liaison personnel are furnished by the supporting unit. Usually, the corps nondivisional engineer battalion supporting a division keeps a liaison officer at the division engineer battalion command post (CP) or at the office of the assistant division engineer. In critical operations, such as river crossings, the battalion commander of the supporting battalion is located at the division engineer's CP, or occasionally the supporting engineer group commander will establish a forward CP at the division command post with the division engineer.

143. Administration

All units of the brigade and combat groups are administratively self-supporting. In some cases, administrative functions of the separate units are pooled at group headquarters.

144. Supply

a. Supply Accounts. Each of the separate engineer combat units and each battalion of a group establishes a supply account with the supporting technical services; however, the units may route requests for critical items through the group S4, who in turn may route the requests through the brigade S4.

b. Water Supply.

(1) The exclusion of the brigade and group from the chain of supply does not apply to water supply, which is con-

sidered a service. Water supply for supported units is an important phase of the brigade and group mission, and is an S4 function. Though he has no water supply personnel, the S4 plans water supply operations and supervises the water supply activities of the battalions. Detailed reconnaissance is performed by battalions acting under group orders or on their own initiative. Orders for water supply reconnaissance are initiated by the group S4.

(2) Usually, only three of the four water supply teams of a battalion are operating at one time. The fourth is packaged and ready for future operations. When the battalion installs an advanced water point, one water point in the rear is abandoned or turned over to a water supply team of another unit. It is desirable in a rapidly-moving situation to not commit all of the four teams simultaneously.

(3) A water supply team is not entirely self-sufficient. Access roads and any other necessary clearing and grading must be provided by other engineer units. If traffic control is a problem, the assistance of military police must be obtained by request from group headquarters. The security of the water point must be assured by neighboring units. Water points will frequently be at a distance from battalion headquarters. In such cases, the water supply team is attached to a nearby engineer combat company, the company commander becoming responsible for the support of the water point and personnel, including accessory construction, security, and rationing (TM 5–295).

(4) In the absence of orders to the contrary, water points serve all troops requesting water. Rationing of water is a function of command, and the battalion will enforce such limitation of water use only by direct order of higher authority (FM 101–10).

145. Maintenance

a. An engineer combat group is authorized a large number of major items of equipment, and the required maintenance can become a major problem. Engineer equipment, in particular, requires regular maintenance even under the best operating conditions. During operations in frigid, tropical, desert, and mountainous areas, or during adverse weather conditions, maintenance problems are greater. Unit commanders must establish and main-

tain firm maintenance programs and schedules (TM 5–505 and TM 9–2810).

b. Repairs are performed at the lowest echelon of maintenance consistent with the nature of the repair; the availability of repair parts, tools, equipment, and time; the skills of personnel; and the tactical situation. However, no echelon of maintenance performs the work of a higher echelon at the expense of hindering the accomplishment of the assigned function.

c. Maintenance personnel can usually be moved to the equipment easier and faster than the equipment can be moved to the personnel. For this reason, contact repair service is established by providing contact maintenance teams, with repair parts and special equipment. This saves transportation and puts equipment back into operation in the least possible time. In addition to repairing equipment, these teams render all assistance possible to using troops by inspection, by replacement of components, and by giving technical advice on all items of engineer equipment. Field maintenance units remain close enough to the units being served to give adequate contact support.

d. Units of the engineer combat group are supplied with repair parts for engineer equipment by the engineer field maintenance company. When time is limited and parts are urgently needed, subordinate group units may requisition directly from parts depot companies if authorized to do so. Ordnance parts are requisitioned from appropriate ordnance supply units.

e. Responsibility for maintenance and care of equipment exists at all levels of command and extends down to the individual operator. Each commander is responsible for the planning and organization of an effective maintenance system and for the training, indoctrination, inspection, and coordination of his command as necessary to assure careful use and satisfactory maintenance. Higher commanders and members of their staffs and inspection teams frequently inspect the equipment of the unit for maintenance and assist in maintenance problems. Special maintenance units perform maintenance of a higher order than the organizations can accomplish; but this does not relieve the commander from his responsibility. For specific instruction on maintenance of engineer equipment, see TM 5–505.

146. Communications

a. The value of reliable signal communications cannot be overestimated. The elements of the brigade and groups normally operate at considerable distances from each other. At the same time, the demands of their tasks are usually of immediate and critical importance; and the situation in the area of operations is rapidly

changing. Under these circumstances, the ability of a commander to direct and control operations is dependent upon his communications.

b. Group headquarters within the corps area will operate within the brigade communication net, under the standing operating instructions published by the brigade. All units assigned to a combat group within the army area will operate within the group communication net, which is operated by the group communication section.

c. When telephone communications exceed the capability of the group's organic system, a service must be established by request to an area signal center. If an engineer battalion or company is operating at a great distance from its parent headquarters, a request must be made to the corps or army signal officer for the location of the nearest area signal center. The need for signal communications may govern the location of the group headquarters and the headquarters of assigned or attached engineer units (FM 24–18 and FM 24–20).

147. Construction

The nondivisional engineer combat units construct, maintain, and repair roads, fords, culverts, fixed and floating bridges, obstacles, landing strips, command posts, supply installations, and

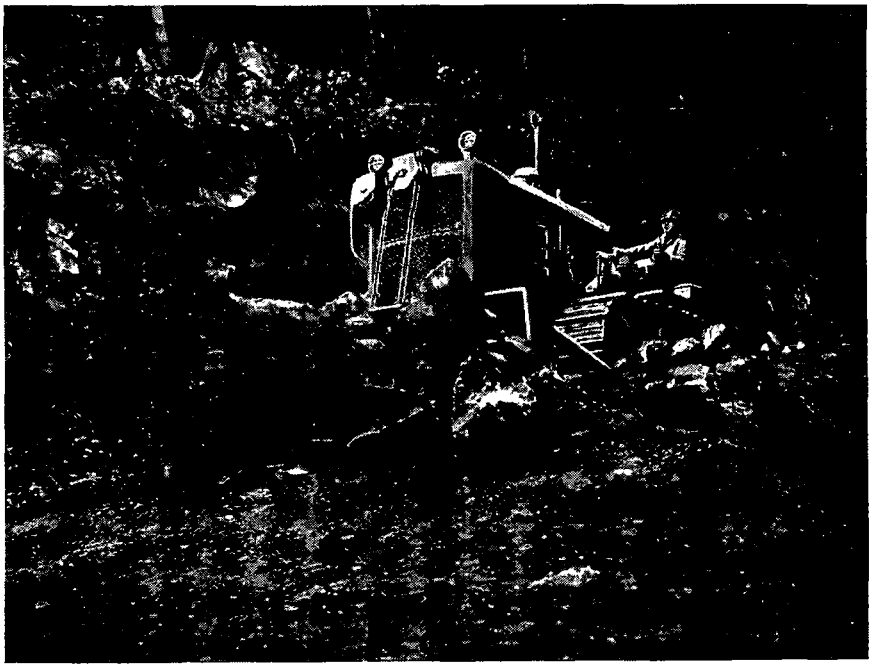

Figure 37. Dozer widening road.

shelters (fig. 37). Since transportation, materials, equipment, and manpower are always limited, only bare necessities are provided; and simple designs are used to conserve time and materials.

a. Roads.

(1) The ground mobility of a field army is influenced by the number and condition of the roads over which the field army must move. The existing road net is rarely adequate for the intense traffic and heavy loads of a modern army, and it must be improved and constantly maintained (fig. 38). The engineer combat units are employed on road construction and repair far more than upon any other category of work.

(2) Road improvements and repairs must be done rapidly, making maximum use of local resources. The road must be able to stand up under hard usage; and it must be planned to allow for expansion and improvement as well as to meet immediate need. Roadwork is progressive in character. Hasty repair of existing roads and installation of temporary bridges, necessary for the passage of combat elements, are followed by progressive improvement and new construction, successively more deliberate and permanent. The work is greatly complicated by factors not present in civil construction. It cannot await good weather or ideal materials (fig. 39). It

Figure 38. Engineers maintaining a road.

cannot interrupt traffic. It is often subject to fire from enemy artillery, air, or ground troops.

(3) The battalion within the brigade or groups is, in most cases, assigned responsibility for the road net in a given area. Orders prescribe certain details as to what existing roads are to be maintained and what new roads are to be built; but in the early stages they do not direct details of materials, design, or method. The mission of the battalion is to see that the roads in the assigned area pass the traffic imposed upon them without delay. The road net is not completed with the first round of repairs and improvements. Certain portions will break down under heavy traffic, and repairs must be prompt. The battalion commander needs to know at all times the condition of the road net; and he should be quick to adjust assignment of equipment, materials, and labor. The assignment of a mission of this kind can frequently be predicted in advance from the direction of movement of our forces. The battalion should be prepared by advance planning, based on information gained from preceding units, advance reconnaissance, and aerial photographs.

(4) For further general discussion, and for reconnaissance, design, construction, and maintenance of military roads, see TM 5–250.

b. Bridges.

(1) Tactical bridging is one of the most critical tasks of the nondivisional engineer combat units. The combat bat-

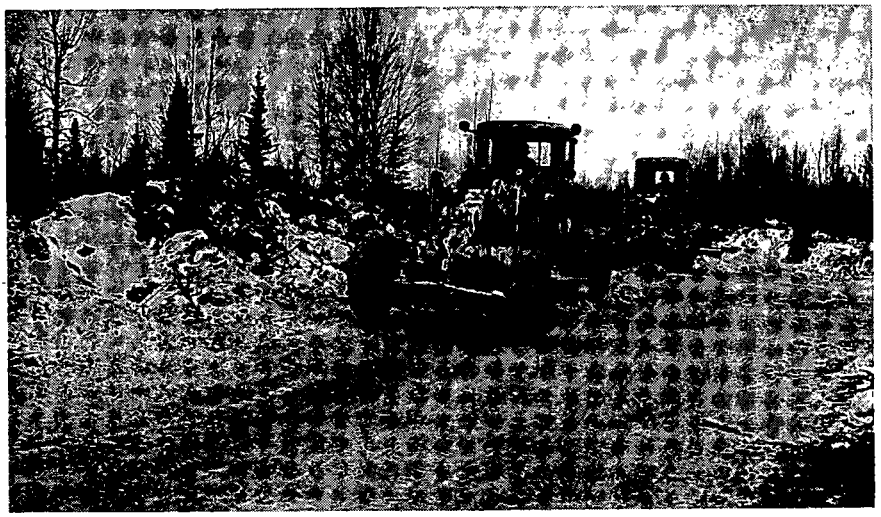

Figure 39. Maintenance of snow-packed road.

talions must be highly trained in the erection of the bridge equipage of the bridge companies of the combat group and in the construction of other types of bridges (fig. 40), including expedient bridges.

(2) Tactical bridge equipage is replaced as soon as possible with semipermanent fixed bridges, fills, or culverts. The latter work will frequently fall to the combat battalion. Since the equipage must remain in place until its substitute is ready and since the equipage may be urgently needed, the work is usually critical. The bridge company may dismantle the bridge and remove it from the site, but the battalion is usually directed to do this work.

(3) For further discussion of bridges, see FM 5–36 and TM 5–260.

c. *General Construction.*

(1) The combat battalion or groups may be called upon to build such structures as storage and supply facilities, and to assist in army airstrip construction. Structures will follow the standard plans contained in TM 5–302. Layout and site drawings, when necessary, will be provided by S3 of brigade or group headquarters, but such matters will frequently be left to the discretion of the battalion commander. The battalion commander is expected to requisition the materials and any special equipment needed unless the brigade or group S4 arranges in advance for a credit for the battalion at the appropriate

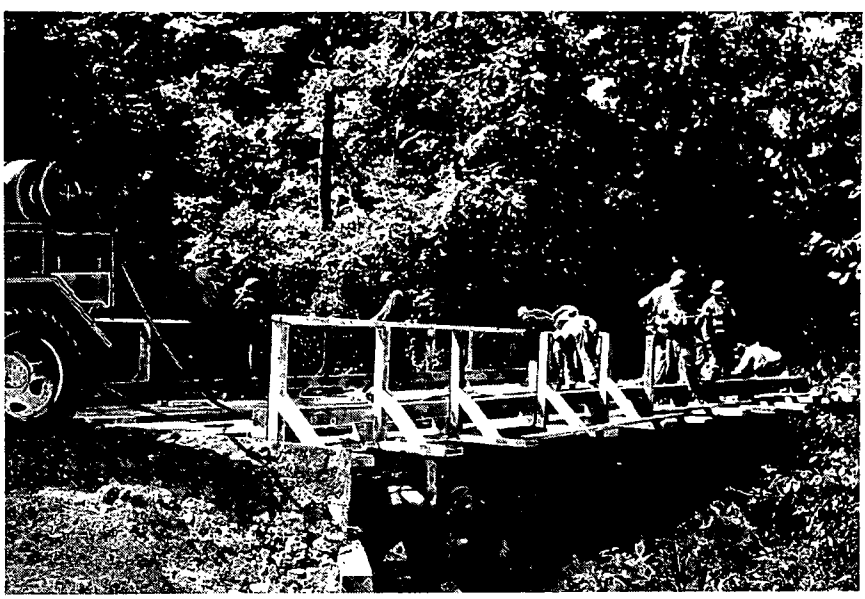

Figure 40. Construction of a timber bridge.

supply point or depot. Airfield construction is covered in TM's 5–250 and 5–251.

(2) For repairs and alterations to existing structures, the battalion commander should be given latitude in details; and he may give similar latitude to the subordinate officer in charge of the work. Portions of the plans contained in TM 5–302 should be used whenever applicable. If a representative of the element to use the structure is available, he should be consulted, but the engineer officer in charge should be on guard against unnecessary, even though desirable, additions and refinements.

148. Training

a. Purpose. Modern warfare, with its accelerated tempo and high-damage-level weapons, demands greater combat engineering effort by all arms and services. Increased dispersion and frequent displacement require the nondivisional engineer combat group commander to assume greater responsibility, to develop a higher degree of initiative, to exercise greater ingenuity, and to attain a higher degree of technical proficiency. Training is conducted in order to insure increased efficiency in command management and utilization of equipment, personnel, and resources available to the engineer. Detailed planning and practical construction methods are necessary in order to provide a rapid and economical execution of even simple engineer tasks.

b. Engineer Individual Training.

(1) Individuals of all echelons are trained to make maximum use of field expedient methods and of immediately available local materials.

(2) Engineer officers receive training in nuclear weapons employment and effects. This training is incorporated in regular training materials.

c. Engineer Unit Training.

(1) Flexibility in the employment of engineers, especially at the outset of hostilities, dictates that nondivisional engineer combat units be thoroughly trained in the construction of field fortifications, protective construction, barrier and denial operations, demolitions, and construction of tactical bridging. It is also necessary that nondivisional engineer combat units be trained to suspend construction activities and rapidly displace in order to conduct combat operations or provide close support to combined or joint operations, such as amphibious operations and airborne landings.

(2) Independent operations of the engineer combat battalion and company, for short periods, without parent organization support is stressed during training. Job organization training for round-the-clock operations is emphasized, especially under adverse weather and terrain conditions.

(3) Emphasis is placed on the utilization of army air transportation and intertheater air transportation for operational and logistical requirements.

(4) Training in the effects of nuclear weapons is conducted. Emphasis is required on such tasks as clearing rubble and tree blowdown, fighting mass fires, decontaminating areas through the use of earth-moving equipment, and providing the means for passing through or around nuclear craters or contaminated areas.

(5) Teams down through platoon level in the engineer combat battalion are organized and trained to employ atomic demolition munitions (ADM).

(6) Camouflage training is stressed at all levels and should include deception as it applies to engineer support of tactical operations. This training is intergrated with other training whenever possible.

(7) Engineers are trained in specialized techniques and task organization designed to assure rapid construction of stream-crossing means, such as the use of rear-area fabrication and service transport of rafts and bridge sections. Emphasis is placed on the rapid disassembly, waterborne movement, concealment, and rapid reassembly of crossing means at alternate sites.

(8) Extensive training in breaching techniques and a thorough knowledge of foreign mine warfare equipment are necessary due to the great emphasis that some foreign powers place on this particular type of warfare.

(9) Engineer construction specialists are thoroughly trained in the use of handtools and in effective employment of heavy construction equipment. Included in the latter category are special devices, such as minelaying equipment and obstacle erectors.

(10) Training in the use of night vision equipment, such as infrared devices and floodlights, is stressed; and conduct of engineer tasks in the dark is emphasized.

(11) All nondivisional engineer combat troops are indoctrinated in the manner and importance of observing, seeking, and rapidly reporting information of an engineer nature so that engineer intelligence is promptly devel-

oped. Some of these individuals should receive technical training in the production and use of engineer intelligence, with specialization on selected geographical or political areas, or in technical subjects.

(12) All nondivisional engineer combat units are organized and trained to protect themselves from local ground attacks.

d. Training for Organizational Maintenance Personnel.

(1) Maintenance personnel of nondivisional engineer combat units are trained to perform maintenance on organic engineer equipment to the extent practicable with organic tools and authorized repair parts.

(2) Because of dispersion, rapid movement, and the greater dependence of operational capabilities upon machines and equipment, all operators should be trained in organizational maintenance.

(3) Low-density, but operationally critical, equipment is supported by an adequate number of operator-repairmen within the using unit. This repair capability is normally obtained by augmenting school-trained personnel with personnel cross-trained on the job in the unit.

e. Responsibility. The engineer combat group commander is responsible for training in the group. The commanders of units assigned or attached to the engineer combat group are responsible for training their units.

f. Training Materials. Fundamental training doctrines and principles are outlined in FM 21–5; and specific techniques of military instruction are given in FM 21–6. Special training instructions are published in training circulars, subject schedules, and periodic training directives. Training generally follows the army training programs (ATP's) provided by the Department of the Army. Training films, film strips, and visual training aids should be used when possible.

g. Equipment. If equipment necessary for training cannot be obtained, expedients are used. The training schedule is arranged so that available equipment can be rotated among using units.

h. Training Time. Army training programs break down the time to be devoted to each subject in a 44- or 48-hour week. A 44-hour week is the minimum training week. Night operations, bivouac, field exercises, and maneuvers require more time. The Department of the Army publishes, from time to time, specific information on the number of weeks of basic, unit, and combined training.

i. Training Area. A training area should approximate the terrain and climate of the probable theater of operations. It

should contain a wide variety of soil and terrain conditions; and it should be large enough that training in such subjects as explosives and demolitions can be isolated.

j. Training Inspections. Frequent training inspections are made, to check on the progress of training and to determine what must be stressed to meet the training standards. Engineer soldiers are first tested on their individual military and technical proficiency and then on their abilities as members of an engineer unit. Performance in battle is the only true test of training.

Section II. INTELLIGENCE AND RECONNAISSANCE

149. Types

The planning and conduct of operations by a commander depend to a great extent upon the use of all available information bearing upon the situation. The information affecting the nondivisional combat engineer organization is of two types. First, for the security of engineer operations or when the organization is engaged in repelling hostile attacks, information of the tactical dispositions, strength, and capabilities of the enemy and of friendly troops is essential. Second, the engineer operations of the organization require the use of much physical data on matters such as terrain, routes of communication, weather, structures, engineer materials and equipment, and water supply within the area of such operations. Combat intelligence is dealt with in FM 30–5 and FM 100–5 and will not be discussed further in this section. The special concern of the battalion is the physical information bearing on engineer operations. This is called *engineer information* and, when it is evaluated as to its reliability and interpreted to determine its significance, it is called *engineer intelligence* (FM 5–30). The process of gatherng engineer information in the field is called *engineer reconnaissance* (FM 5–30 and FM 30–10).

150. Responsibility for Intelligence

Each commander is responsible for the collection of information within his command and for its dissemination not only to his subordinate units but to his next higher headquarters and to adjacent units. This responsibility extends to all information conceivably useful to other units as well as that especially useful to his own unit. Furthermore, it is a continuous responsibility. Though from time to time he will be directed to obtain certain specific information, he is never relieved from the duty of gathering and reporting all pertinent information. These considerations necessitate special training at all levels in his command down to and including the individual soldier. This training must include

not only the nature of the information required and the mechanics of its collection and reporting, it must also include the most thorough indoctrination as to the importance of information and the individual responsibility of all personnel to collect and report it without specific instructions.

151. Sources of Engineer Information

a. The nondivisional combat engineer unit will receive a great deal of information generally applicable, and some specifically applicable, to the area in which it is operating or may expect to operate. This derives from many sources outside of the organization. It will reach the organization in the form of intelligence reports, maps, photographs, and special communications from higher headquarters to which the organization may be attached. In addition, the organization may and should request specific information as needed when its procurement is beyond its capabilities. The most frequent need for such information occurs in connection with planning for operations in an area still occupied by the enemy. In this connection, it should be remembered that high levels of command have unusual resources for gathering information, such as specially trained intelligence teams, fighter escorted reconnaissance aircraft, agents in enemy territory, and the agencies of allied armies and governments; and it should never be assumed that needed information is unobtainable if it is not automatically furnished.

b. Besides the information which flows both up and down within the chain of command, much valuable information is gained by liaison with neighboring units who, in turn, are furnished such information as may be useful to them. Such liaison generally is established between the respective intelligence staff sections of the units concerned.

c. A large portion of the information used by the brigade and group headquarters is that which their attached units collect by engineer reconnaissance. This activity calls for an important portion of the unit effort, which is not always accorded it. Its importance should never be underestimated.

152. General Principles of Reconnaissance

Engineer reconnaissance missions are of two types. *General* engineer reconnaissance is for the purpose of securing engineer information of a general character within a defined area. *Special* reconnaissance is to obtain full data regarding a definite task or tasks of a definite situation. General reconnaissance is initiated as soon as the organization enters the area in which it is to conduct operations. It surveys the availability of local engi-

neer materials and equipment and of water, collects general physical data, and assists in solving operational problems of immediate concern. It is followed by special reconnaissance to obtain more detailed data necessary to the solution of these problems. Occasionally, a reconnaissance party may be directed to perform both general and special reconnaissance.

153. Personal Reconnaissance by Commanders

The reconnaissance activities thus far described in this section are for the purpose of supplying information for the use of the subordinate commanders which they would obviously not have the time to gather for themselves. It must never be presumed, however, that they are a complete substitute for personal reconnaissance by the commander concerned. Each commander should personally reconnoiter the area and the sites of operations to the fullest extent that his time will allow. It is only by such personal observation that he can acquire the visual background essential to the full interpretation and understanding of the reports which reach him, can formulate his directives, and can properly review the plans and orders framed by his staff. This type of reconnaissance follows no definite pattern. It should be planned and purposeful, and observations should be recorded. The commander may designate certain of his assistants to accompany him to save time in giving instructions resulting from the reconnaissance.

154. Air Reconnaissance

Probably the most important use of the helicopter operated by the aviation platoons of the group headquarters is in air reconnaissance. Reconnaissance by air has a great advantage in the speed with which it can cover a large area and the ease with which it can reach an otherwise inaccessible area. Typical missions in which it is useful are—

a. Reconnaissance of roads, railroads, routes, bridges, and river-crossing sites.

b. Reconnaissance of barrier lines, minefields, and roadblocks.

c. Locating and estimating quantities of engineer materials, including rock, sand and gravel, and timber.

d. Checking terrain maps for accuracy, sketching local areas, and taking photographs.

e. Locating water points, bivouac areas, and airstrip sites.

f. Locating beach and underwater obstacles.

g. Locating and observing forest fires.

h. Reconnoitering sites for use of ADM and obtaining target data.

Section III. PLANS AND MISSION ASSIGNMENTS

155. Introduction

The brigade or group seldom operates as a unit. Except in training and during periods of rest and recuperation, it does not bivouac together and only in administrative movements does it move as an organization. It is rarely employed in combat engineer operations on a single group project. The mission of the brigade or group is normally accomplished by subdividing it into clearly defined battalion missions. The battalion missions are not integrated to the extent that they require direct on-the-ground group management but only general supervision, coordination, and the support of the separate companies of the group and whatever additional support the group commander may obtain from other sources. The preparation of a rear area defensive position, group action in infantry type combat, and river crossings are exceptions to this rule. With these exceptions, however, the group mission in most cases is a composite of the battalion missions.

156. Plans

a. The successful execution and timely completion of engineer tasks depends on thorough planning. While it is true that a task is rarely completed without encountering some unforseen difficulties and contingencies, it is equally true that careful planning reduces such eventualities to a minimum, allows for them, and provides for the orderly completion of the work in the time allotted with the men, equipment, and materials provided. The engineer commander should gather reliable information, estimate rather exactly the requirements of his task, fit his resources to those requirements, and insure the fulfillment of his mission. This is engineer planning. It involves visualizing the execution of the task from start to finish with all its component parts and complex factors, leaving no predictable element unconsidered. Concurrent planning at successive echelons is encouraged.

b. Detailed planning is done by the individual in direct charge of the task. It is progressively less detailed at higher levels. For example, when a battalion is employed as a unit on a single task, battalion engineer planning is only sufficiently detailed to insure that work assignments and equipment and material allocations are adequate for the task at hand and best suited to the battalion's capabilities. It must necessarily consider methods best suited to the job, but the methods considered are not dictated to the subordinate commander to whom the work is assigned. The latter must be left free to make his own plan. To do otherwise robs him of the opportunity to exercise his own initiative and

destroys his sense of responsibility for the results achieved. On an important or very complex job, however, the subordinate commander is often called upon to present his plan; and such detailed planning as has been done at the higher level is most useful in such review.

c. Planning is not terminated with the completion of an initial plan for a particular mission or phase of operations but it is a continuous process. As operations progress, plans must be reviewed and revised as new factors develop. Furthermore, planning must envision probable future developments. For example, in an offensive operation the assignment of work in an area immediately forward of that in which a battalion is employed is often almost a certainty; and plans for much of the work may and should be prepared, even if only in tentative form, in advance of the receipt of actual orders.

157. Mission Assignments

The principles of observing the chain of command and the integrity of elements are followed at all levels of command in the assignment of missions to subordinate units. In general, battalion missions give the battalion commander greater latitude than the battalion gives its companies. Area assignments are more common for the battalion than for the companies. Assignment of a multiplicity of small tasks to the battalion or companies should be avoided whenever an area or general mission will suffice.

158. Principles of Mission Assignments

a. The accomplishment of a group mission and, in turn, the missions of battalions and separate companies is set in motion by assigning parts of the work to subordinate elements, after having balanced the requirements of each part against the capabilities of the element to which it is eventually assigned. Assignments are made on a task or area basis. An area assignment requires that the element perform all the engineer work or all the engineer work of a certain character within a defined area. A task assignment requires the execution of a definite task or tasks at a prescribed site or sites. The area method of work assignment is used when it is not possible to define all the small tasks required within a given area and sometimes when the work necessary in an area may change during the period of the assignment. A common area assignment is all the work on roads, fords, culverts, and bridges within a certain area. Such an assignment is necessitated by the fact that the work consists of a summation of small tasks and that it may be affected by enemy bombardment and the effects of our own traffic.

b. In assigning work, it is most important that the integrity of elements be maintained. The assignment should be worked out so that it fits the capabilities of the element, reinforced, if necessary, by elements from the separate companies of the group. Departures from this principle are most destructive of morale and esprit. It will sometimes be found impossible to avoid attaching a minor fraction of one unit to another; but if it should be determined that it is unavoidable, then the attachment should be terminated as soon as possible.

c. It is imperative that the chain of command be observed in the assignment of missions. Only in unusual circumstances and for brief periods of time should a platoon of a company be placed directly under battalion command, a squad of a platoon under company command, or a part of a squad under platoon command. An example of a permissible violation of this principle is the detachment of a small number of men from a company for the formation of a specific battalion reconnaissance mission under the direction of the battalion S2. Routine small housekeeping details are also permissible, but their number and frequency should be kept at an absolute minimum by the higher headquarters.

Section IV. SECURITY

159. Measures

a. Each commander is responsible for the security of his troops, installations, and lines of communication. Security measures embrace all means of preventing enemy interference, surprise, and observation. They include active measures, involving the use of security detachments, and passive measures, such as concealment, dispersion, and the use of obstacles and warning systems.

b. The extent of security measures should be appropriate to the threat. Security detachments weaken the working strength of the command. The degree of security provided at any site must be carefully evaluated to prevent undue diversion of construction manpower. Elements of the engineer combat battalion normally operate in locations in which considerable security is afforded by other troops on their front and flanks. Their principal concern is usually with interference by dismounted patrols, motor or mechanized raids, air attack, and action by guerrillas and partisans (FM 31–15).

160. Security on the March

a. On the march, security to the front is afforded by an advance guard. The mission of the advance guard is to secure the uninter-

rupted advance of the main body by brushing aside resistance. The strength of the advance guard varies with the size of the command and the nature of the resistance to be expected. For a battalion it should not exceed one company and for a company one platoon. A company acting as an advance guard sends forward an advance party of one platoon, which, in turn sends out a point of one squad. Distances between elements depend upon the terrain, visibility, and speed of movement. In general, they are the minimum necessary to prevent the surprise of the following element.

b. Security against attack from the rear is obtained by a rear guard, disposed in the same manner as an advance guard but in reverse. Its strength is usually less than that of the advance guard; and, in some cases, it is very small or dispensed with entirely.

c. Flank security for the battalion and lesser elements is usually obtained by fast movement and constant observation to the flanks. If a parallel route exists, flank patrols may afford continuous flank security. More often, they are dispatched from time to time to investigate particular localities offering a threat to the column.

d. A column on the road, particularly a motorized column, is extremely vulnerable during daylight hours to sudden attacks by low-flying enemy aircraft. When the danger is great, night marches are the rule. When movements are made in daylight, the distances between vehicles are increased as much as is permitted by the necessity for mutual support and control of the movement. The 50-caliber machineguns mounted in ring mounts in trucks are distributed evenly along the column.

161. Security in Bivouac

a. Security in bivouac is afforded by a covering detachment called an outpost. A fully organized outpost consists of outguards, support for each group of outguards, and a reserve for the whole. Outguards are usually located on the principal avenues of approach. Each outguard posts sentries in advance of its main position and maintains contact by patrols. A battalion in bivouac may need as much as one company on outpost and a company one platoon, but these requirements may often be considerably reduced. Machineguns and rocket launchers should be disposed behind the line of outguards with proper fields of fire to cover the approaches to the main body. Roadblocks, wire, and minefields are valuable adjuncts to a defensive position and should be used when the time and labor involved in placing and removing them is not incommensurate with the protection required. Means of rapid communication between elements of the outpost system and between it and the main body must be provided in order to insure timely warning and

concerted action. Radio, messengers, and visual and sound signals are used.

b. The group headquarters and headquarters company and the separate companies constitute in a sense a separate component command of the group. In most situations, all or most of the separate companies will be located near group headquarters in the rear of the group area. These companies, along with the group headquarters and headquarters company, should be regarded as a battalion with respect to certain tactical considerations. The principles of battalion movements, security, camouflage, and defense against chemical, biological, and radiological attack should be applied similarly to this group of units.

c. Battalions are usually located at some distance from group headquarters. They are responsible for their own security without specific orders, and they establish and conduct security measures as required in coordination with other units in that area. Occasionally, when working closely together, some coordination between battalions by the group commander may be advisable; however, battalion commanders are responsible for coordinating their security plans without the intercession of group headquarters. In some situations, when engineer missions require the uninterrupted and undivided effort of engineer elements, the group commander should attempt to arrange with the commander of the supported unit for the assignment of the security mission to other troops.

d. Group headquarters and adjacent separate companies will frequently be covered by the security system set up by corps or army security troops for the protection of corps and army headquarters, service troops, and installations. If this is not the case, and a battalion of the group is nearby, the battalion commander should be directed to cover the entire security system. If the group headquarters and separate companies are not otherwise protected, security must be organized with personnel and weapons of the separate companies to provide maxmium protection. In any of these cases, special attention should be given to the protection of the equipment of the separate companies against air attack and against damage, destruction, and theft of essential parts by guerrillas and partisans.

162. Security at Worksites

a. Security detachments are posted to cover the approaches to worksites to withstand minor harassments and to prevent surprise. The number of men in such detachments is kept to a minimum by making full use of organic communication equipment, machineguns, and rocket launchers, supplemented by readily removable roadblocks, wire obstacles, and antitank mines (FM 5–15, FM 5–31,

and FM 20–32). Men of the work party keep their arms close at hand, and they are trained to assemble and deploy quickly on warning.

b. As protection against air attack, vehicles and equipment are dispersed and concealed when not in use (FM 5–20). Provision is made for warning by gong, siren, or other means. When the alarm is given, men disperse and take cover. They return to work promptly when the danger is past. Observers must be well trained in the identification of aircraft and must be cautioned not to interrupt the work by sounding the alarm for aircraft which are too high or too distant or which are of a type unlikely to attack, such as bombers. The vehiclular-mounted machineguns may be located and manned to fire on low-flying enemy aircraft.

163. Guerrilla Activity

a. Guerrillas are armed and organized bands of enemy irregular forces acting either separately from, or in conjunction with, regular forces. Their activities are characterized by raids, ambushes, and attacks on communications and installations, both in force and in small parties. Their efforts are usually directed against rear areas. If guerrillas are active, the menance must not be underrated. They frequently act spasmodically; and troops in rear areas may acquire a false sense of security, which must be countered by strict supervision of security discipline.

b. Normal security measures are taken to guard against guerrilla attacks, special attention being given to the security of arms, ammunition, and other equipment of value to guerrillas. Double guards are posted; and trip wires and other devices are installed to prevent approach without alarm. Personnel keep their arms close at hand and are instructed in assembly for instant action. Security dispositions are altered frequently since they may be subject to observation. Natives are not permitted to enter sensitive areas, and those nearby are carefully screened or evacuated. For further information on operations against guerrilla attacks, see FM's 31–15 and 31–21.

Section V. THE ADVANCE TO CONTACT AND THE ATTACK

164. Duties

a. Nondivisional engineer combat units will often be required to assist combat organizations in the advance to contact and the attack. The duties of engineers in the advance and in the attack proper are quite similar in nature and will be considered together. A typical list of engineer duties includes the following:

(1) Engineer reconnaissance.

(2) Repairing and maintaining roads and trails for troop movement, supply, and evacuation.
(3) Constructing bridges and bypasses.
(4) Assisting in flank security by constructing obstacles in likely avenues of enemy attack.
(5) Removing, neutralizing, or destroying all types of obstacles that hinder forward movement of the supported forces.
(6) Constructing advanced landing strips (fig. 41).
(7) Such general duties as providing engineer materials and potable water which are continuous requirements throughout the operation.

b. Because there are seldom enough engineer troops available to do all the engineer work necessary to assist the advance of all of the advancing units, the other troops do as much pioneer work as possible in order to help themselves. All combat and service troops are trained in the installation and removal of antitank and antipersonnel mines. Infantry may clear passages through wire and provide bridges over narrow and shallow streams by expedient means.

165. The Group in Support of a Division

a. A corps group usually has the primary mission of supporting a specified division; and, in addition, it may have the mission of performing specified tasks in the corps area. Upon receipt of orders to support a division, the group commander makes immedi-

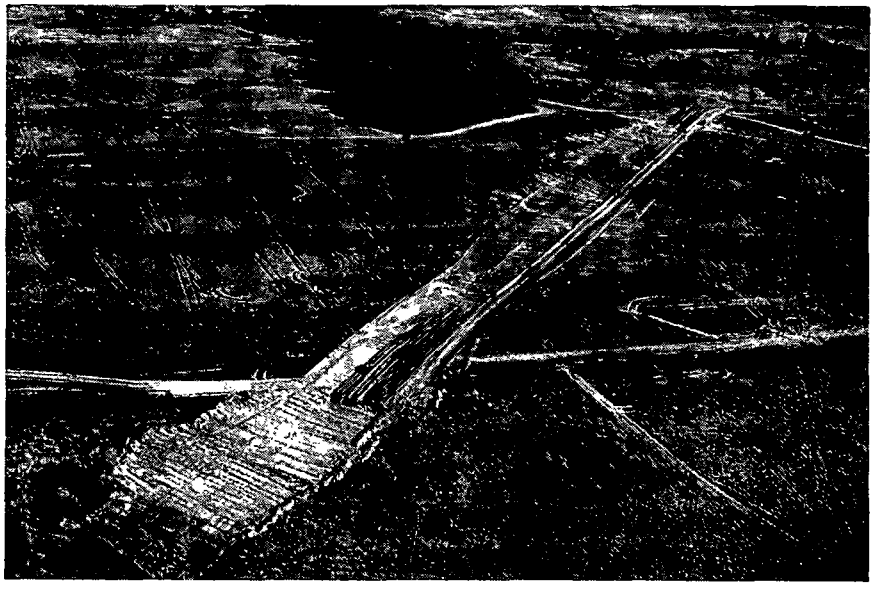

Figure 41. Engineers constructing a forward army airstrip.

ate personal contact with the division commander and his staff and makes specific arrangements for the execution of support missions. The rear boundary of the battle area should be considered the forward boundary of the group's responsibility; and it should accept all missions requested by the division commander up to that line. In order that these close supporting missions may be accomplished without delay, it is usually necessary for the group commander to station a battalion in the division area and direct the battalion commander to maintain constant liaison with the division engineer. The battalion should be instructed to accept at once any mission requested by the division commander either directly or through the division engineer. If the battalion commander does not possess the means to accomplish the mission, he must report the fact to the group commander at once in order that the latter may provide such means. If the group commander does not have the means, he must request the necessary assistance from the brigade commander.

b. The group, at the outset of the attack, may take over a certain amount of the divisional battalion's responsibilities in the divisional rear areas. This is accomplished by the other two battalions of the group being stationed, either laterally or longitudinally, in the corps area, immediately behind the division rear boundary. These battalions will be employed on area and task assignments, working forward into the division area to an informal boundary agreed upon by the group commander and the division engineer. As the attack advances, the group will progressively extend its boundary forward to relieve the divisional engineer battalion. When needed, elements of the battalions in the rear are given specific assignments still further forward.

c. Regardless of the seniority of supporting engineer unit commanders, the commander of the division engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander.

166. The Group in Support of a Corps

a. The operations of an engineer combat group in support of a corps closely parallel those of a corps group in support of a division except that the work is not done as far forward. Upon receipt of orders to support a corps, the group commander immediately makes personal contact with the brigade commander and arranges with him the method of rendering the support and the liaison to be maintained by the group with the brigade. This generally consists of frequent visits to the brigade by the group commander and liaison officer. It is the duty of the group commander to point out to the brigade commander all support missions in the corps area

which are within the capability of his force in order that brigade troops may be made available further forward in support of divisions. The group commander should locate his command post as far forward as possible without sacrifice of his ability to supervise the work of his group.

b. The most important supporting missions which the group is called to perform in support of a corps are—

(1) The maintenance of the main supply routes and other main roads.
(2) The replacement of tactical bridges.
(3) Clearing minefields.
(4) Use of its elements in support of armored or artillery organizations of corps.

167. The Group Support in Army Area

There are three engineer combat groups assigned to the army area. One or more of these army engineer combat groups may be assigned to a corps for the attack, operating under the direction of the corps commander and brigade commander. Or they may be placed in direct support of corps, working as far forward into the corps area as necessary to enable corps engineers to concentrate on work still further forward. The remaining army engineer combat groups assist the troops within the army area by performing general combat engineer support type missions. The emphasis is on maintenance and improvement of the routes of advance (fig. 42).

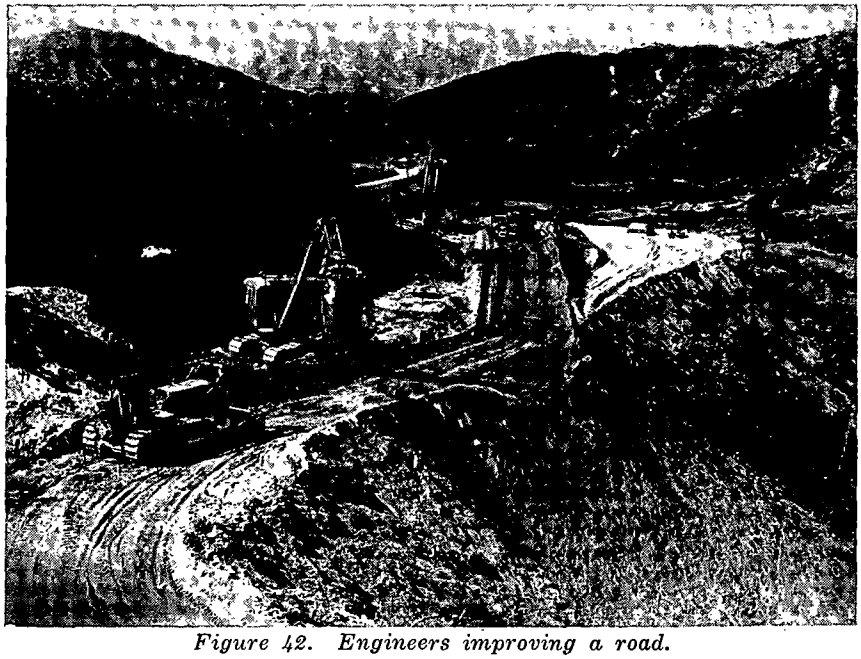

Figure 42. Engineers improving a road.

168. River-Crossing Operations

a. Types of Crossings. The immediate objective of the attack on a river line is to get across quickly and economically and establish one or more bridgeheads to protect the crossing of the remainder of the command. The actual crossing is a means, not the end sought. Plans for crossing a stream or river over which the enemy has destroyed all bridges depend on several factors, including the strength with which the enemy holds the far shore and the characteristics of the river. There are two general types of crossing as indicated below.

(1) *The hasty crossing.* The hasty crossing is characterized by speed, surprise, and minimum loss of momentum in the attack. This type of crossing is, therefore, less vulnerable to nuclear attack. The hasty crossing also requires less concentration of personnel and equipment and usually does not require assistance from nondivisional engineer combat units. A hasty crossing is to be sought in any situation in preference to a deliberate crossing.

(2) *The deliberate crossing.* The deliberate crossing, in contrast, is characterized by some delay in execution, more detailed planning at all levels, and the employment of more extensive crossing means. For this reason, only the deliberate crossing will be discussed. A crossing is termed deliberate when conducted for any of the following reasons: As a resumption of the offensive at the river line; when a hasty crossing is not feasible because of the difficulty of the obstacle or because of strength of enemy defenses, or as a result of an unsuccessful hasty crossing. A deliberate river crossing in the face of the enemy is frequently a corps operation, the corps commander directing tactical operations and the brigade commander directing the employment of corps engineer troops. Planning for the operation begins well in advance. Based on reconnaissance and the study of maps and aerial photographs, a corps tactical plan is developed prescribing division zones of action and the order of crossing division and corps troops. Included in the corps plan is the selection of sites for heavy fixed and floating bridges to cross corps reserve troops, armor, and artillery (fig. 43). One or more divisions are designated to make the assault crossing, others following; and missions in support of the assault divisions are assigned (FM 31–60).

b. Group Assignments.

(1) *In support of corps.* The infantry and airborne division engineer battalions have a limited river-crossing capa-

bility; therefore, these divisional engineer battalions are restricted to spanning short gaps and aiding the assaulting elements. The armored division engineer battalion, however, has an organic bridge company composed of three sets of standard float bridge (M4T6) and an assault bridge platoon (AVLB). This capability permits the construction of float bridges, rafts, trestle bridge, and fixed short spans in support of the assaulting elements. Extensive operations require backup support from corps or army in the form of additional fixed, floating, and assault bridging equipment and units. Therefore, in a deliberate river crossing one corps engineer combat group will normally be placed in support of each of the assaulting divisions. Other group missions in connection with river crossings involve only general engineer work, such as maintenance of routes of communication, and the erection of heavy fixed and floating bridges under the great stress of the assault. Army engineer combat groups are assigned tasks in support of corps engineer combat groups and work forward into the corps areas.

(2) *In support of divisions.* When the group is assigned the mission of supporting a division in a deliberate crossing, the group commander makes immediate contact with the division commander and his staff and especially with the division engineer. The division commander proceeds to develop his tactical plan, of which the engineer plan for the employment of the division battalion and the group is

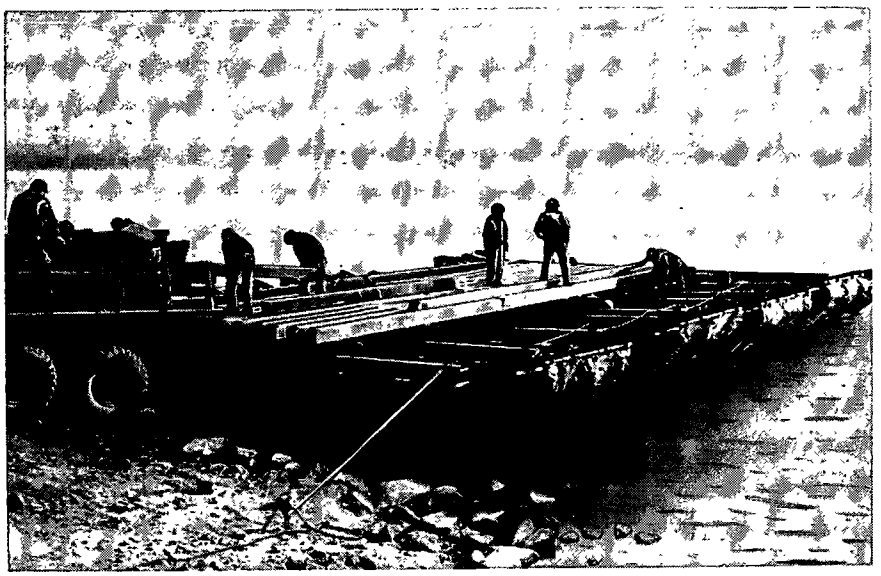

Figure 43. River-crossing operations, raft construction phase.

an essential part. Reconnaissance of crossing sites and approaches are made and, in cooperation with the division engineer, the group commander helps in planning the allocation of engineer tasks and equipment. He points out the missions which the group can perform and accepts any mission he can accomplish.

(3) *Role of division engineer.* Regardless of the seniority of supporting engineer unit commanders the commander of the division engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander. His knowledge of the procedures and capabilities of the divisional units and the method of operations places him in the position of being the engineer who can best recommend the location, employment, and strength of the engineer support. Corps engineer units (including those made available to corps by army) may be attached to, or placed in support of, divisions depending upon the control thereof required by the division commander and the amount and type of assistance required.

(4) *Crossing means.* In a deliberate river-crossing operation, the bulk of the bridging equipment and crossing means will come from the engineer float bridge companies assigned to the corps or army brigade (TM 5–263 and TM 5–265). This unit has organic to it approximately 700 feet of floating bridge, and in addition 70 assault boats, 6 light tactical rafts, and approximately 470 feet of aluminum footbridge.

(5) *Classes of rafts and bridges.* Table I indicates the classes of different types of light tactical rafts in various streams velocities; table II indicates the capacity of the floating bridge; and table III indicates the classification capacities of short fixed spans, when components of the light tactical raft sets are used to provide fixed bridging.

(6) *Capacities of rafts and bridges.* Table IV indicates the capacities of 4-float and 5-float rafts; table V indicates the capacities of the M4T6 bridge; and table VI indicates the capacities of M4T6 bridge fixed spans.

(7) *Erection of crossing means.* The manpower for erection and operation of the deliberate crossing means should come from the engineer combat battalions, army, of the engineer combat groups, thus freeing the divisional battalion to concentrate its engineer support to the division on the far shore.

Table I. Raft Classes, Light Tactical Rafts (Assembly by Successive Pontons)

Type of assembly	Normal						Risk					
	Stream velocities in fps											
	3	5	7	8	9	11	3	5	7	8	9	11
Four-ponton, three-bay	12	12	12	12	9	0	20	20	20	16	12	4
Five-ponton, five-bay	12	12	12	12	9	3	19	19	17	15	12	6
Six-ponton, four-bay	19	19	19	19	13	6	24	24	24	24	23	11

Table II. Classes of Floating Bridge Construction From Light Tactical Raft Sets

Type of assembly	Normal						Caution						Risk					
	Stream velocities in fps																	
	3	5	7	8	9	11	3	5	7	8	9	11	3	5	7	8	9	11
Normal	16	16	13	11	8	2	18	18	15	12	9	3	21	21	17	14	11	5

Table III. Dual Classification Capacities for Short Fixed Spans of Light Tactical Rafts

Clear span (feet)	Class					
	Normal		Caution		Risk	
20	(21)	17	(25)	19	(32)	23
22	(18)	15	(20)	17	(23)	19
24	(16)	13	(18)	15	(20)	17
26	(14)	12	(16)	14	(18)	16
28	(12)	11	(14)	13	(16)	15
30	(11)	10	(12)	12	(16)	14
32	(10)	9	(11)	11	(15)	13
34	(9)	8	(10)	10	(13)	12
36	(8)	7	(10)	9	(11)	12
38	(7)	7	(9)	9	(10)	11

Note. Figure in parentheses represents wheeled load class. Second figure represents tracked load class.

Table IV. Capacities of 4-Float and 5-Float Rafts, M4T6 Bridge

Raft construction	Overall length	Normal crossing (Velocity fps)					Risk crossing (Velocity fps)				
		0–5	7	8	9	11	0–5	7	8	9	11
4-Float normal	87 ft. 1 in.	(50)	(45)	(40)	(35)	(30)	(60)	(55)	(50)	(45)	(35)
		55/1	50/2	45/2	40/3	35/4	65/1	60/2	55/2	50/3	40/4
4-Float reinforced	87 ft. 1 in.	(50)	(50)	(45)	(40)	(35)	(60)	(60)	(55)	(50)	(45)
		55/1	55/2	50/2	45/3	40/4	65/1	65/2	60/2	55/3	50/4
5-Float normal	102 ft. 1 in.	(55)	(50)	(45)	(40)	(35)	(65)	(60)	(55)	(50)	(45)
		60/1	55/2	50/3	45/3	40/5	70/1	65/2	60/3	55/3	50/5
5-Float reinforced	88 ft. 9 in.	(60)	(60)	(55)	(55)	(45)	(70)	(70)	(65)	(65)	(55)
		65/1	65/2	60/3	60/3	50/5	75/1	75/2	70/3	70/3	60/5

Note. Upper figure, in parentheses, represents wheeled vehicle class. Lower figure represents tracked vehicle class and the number of 27-foot bridge erection boats required to hold the loaded raft in the maximum indicated stream velocity.

Table V. Capacities of M4T6 Bridge

Type of Crossing	Stream velocity in fps					
	0–3	5	7	8	9	11
Normal	(50)	(45)	(40)	(35)	(30)	(25)
	55	55	50	45	40	30
Caution	(60)	(58)	(54)	(49)	(45)	(35)
	61	59	55	51	47	37
Risk	(68)	(66)	(62)	(59)	(54)	(43)
	69	67	63	60	56	45

Notes. 1. Upper figure, in parentheses, represents wheeled vehicle class. Lower figure represents tracked vehicle class.

2. Ratings are given for an 18-balk roadway and a 22-balk deck.

3. End spans are 21 ft. 8 in. long and are reinforced witb two floats spaced close together.

Table VI. Capacities of M4T6 Bridge Fixed Spans

Span	Deck width (balk)	Roadway width (balk)	Normal	Caution	Risk
15 ft.	22	18	(100)	(100)	(100)
			100	100	100
23 ft. 4 in.	22	18	(100)	(100)	(100)
			100	100	100
30 ft.	22	18	(90)	(100)	(100)
			65	80	90
	24	18	(95)	(100)	(100)
			70	80	90
38 ft. 4 in.	22	18	(45)	(70)	(81)
			35	51	57
	24	18	(60)	(76)	(90)
			45	55	62
	26	18	(65)	(88)	(95)
			50	60	67
	22	16	(55)	(70)	(81)
			40	51	57
45 ft.	22	18	(25)	(48)	(56)
			25	40	45
	24	18	(32)	(53)	(62)
			30	43	49
	26	18	(42)	(59)	(67)
			35	46	53
	22	16	(30)	(48)	(56)
			30	40	45
	24	16	(42)	(53)	(62)
			35	43	49
	26	16	(48)	(59)	(67)
			40	46	53

Note. Upper figure, in parentheses, represents wheeled vehicle class. Lower figure represents tracked vehicle class.

c. Conduct of a River-Crossing Operation.

(1) *Divisional engineers.* The divisional engineers have the mission of engineer support to the assault units on the far shore. Attached or supporting nondivisional engineers are assigned tasks of construction of rafts and bridges. In an operation where the situation may require the use of assault boats and footbridges to cross assault units, the divisional engineers might be given these tasks, or a portion thereof, in addition to their normal task.

(2) *Consecutive tasks.* To insure full utilization of engineer capabilities, engineer units should be assigned, where possible, consecutive tasks in the crossing.

(3) *Unit association.* The preservation of the integrity of units and of unit association is particularly desirable for a river-crossing operation. The engineer company which

usually operates in support of a specific battle group is employed with that battle group. Additionally, the elements of the corps engineer combat group usually associated with a particular division are employed with that division.

(4) *Nuclear attacks.* Commanders of units planning to cross a river must carefully evaluate the possible scale of use of nuclear weapons and determine vulnerability and the allowable pattern of operations for various assumed situations during the conduct of the operation. Crossing a river in any type of warfare requires forces and tactics specifically designed to conduct such an operation in the face of enemy nuclear attacks and to capitalize an effective employment of friendly nuclear fires against targets of tactical significance. High mobility can be utilized to exploit the chaos following a nuclear attack to seize crossings and sufficient terrain on the far shore of the river before the enemy can react.

(5) *Engineer amphibious support command.*

(*a*) *General.* The engineer amphibious support command (EASC) may be employed to support combat units in any phase or in all phases of either a hasty or a deliberate river crossing. Its communication system and amphibious vehicles make it capable of facilitating broad front crossing in the face of enemy nuclear capabilities. In a major river crossing, the EASC may relieve the divisional engineers of many of the river-crossing responsibilities so that the divisional engineers may give uninterrupted close support to the assault units. The entire EASC may be used in a corps crossing or in the crossing of smaller organizations.

(*b*) *Vehicles.* The EASC contains tracked landing vehicles. These vehicles are capable of swimming inland waters, and they may be used to move supplies, weapons, personnel, and equipment across the river where there are no bridges. The vehicles may also be used to supplement the carrying capacity of bridges and rafts for taking high-priority items across or for other special purposes. The tracked landing vehicle, because of its armored protection, is normally used to cross the assault waves.

d. Joint Operations.. The commander, in planning the equipment to be utilized in a river-crossing operation, should keep in mind that a river crossing can be a triphibious operation; and he should give consideration to the various types of ground, water, and airlifting equipment that may be available.

169. Assault on a Fortified Area

a. Principles Employed. The principles employed in the assault on such an area position are the same as those in the attack, but the assault is made more difficult by barriers and obstacles defended by fire and by the natural advantages of the ground chosen by the enemy for his position. These difficulties are countered by combat superiority, thorough training and preparation, special troops and equipment, and by attacking initially on a comparatively narrow frontage (FM 31–50).

b. Aspects of the Assault.

(1) Four phases characterize the assault on a fortified area. They are:

(*a*) Reducing the hostile outpost system and developing the attack.

(*b*) Breaking through the main line of resistance at the most favorable point.

(*c*) Extending the gap laterally by isolating and reducing emplacements on its flanks.

(*d*) Moving mobile reserves through the gap to complete the reduction of remaining fortifications, while continuing to attack from the front.

(2) These phases are not always clearly defined, and they often overlap.

(3) It is fundamental in the assault that each success be immediately exploited to the fullest. Following any breakthrough, the attack is pressed forward to the next objective. Clean-up missions are left to supporting troops.

c. Engineer Missions.

(1) During the attack, the principal mission of the engineer is breaching the outer and larger obstacles which protect the main fortified positions. Reduction of weapons emplacements, bunkers, and pillboxes, and the clearing of close-in and minor obstacles are the mission of specially organized and equipped infantry elements which lead the attack. This means that the effective gapping of a strong enemy fortification system requires close coordination between the engineers, who gap the line of obstacles, and the infantry, who reduce the fortifications.

(2) Following the breakthrough of a fortified line, the principal engineer mission is to improve and maintain routes through the gap. A secondary mission is to demolish bunkers, pillboxes, emplacements, and like fortifications, in accordance with directives given in orders for the assault.

d. Disposition of Engineer Elements.

(1) The closest coordination between infantry and engineers is required, particularly in the initial phases of the assault. For this reason, engineer elements are attached to infantry assault elements. Infantry battle groups may require as much as two companies of engineers in an assault against a well-fortified area. Divisional engineers cannot furnish the necessary support to participate in the assault, therefore the army engineer combat battalion of the engineer combat groups may be called upon to supplement them. Attachment will ordinarily cease when the main obstacles and positions have been breached and passed.

(2) Except for elements attached to infantry for the initial phases of the assault, corps engineer combat battalions will function in close support of divisional engineers under group control. In this capacity, they widen gaps through obstacles, improve and maintain routes through the gaps, and clear minefields. They work as far forward as possible, relieving divisional engineers to accompany assault elements.

e. Reconnaissance and Planning.

(1) In preparation for the assault, close study is given to the obstacles and minefields which will be encountered, and to the terrain and routes forward through the fortified area. Information comes from ground reconnaissance, supplemented by aerial photographs and other sources. Details which cannot be determined by observation from vantage points within our own lines may be developed by night reconnaissance parties. Study and reconnaissance are aimed at discovering routes through obstacles and minefields most easily cleared and subject to the least fire. To achieve good results, reconnaissance must be carefully planned and organized and reconnaissance parties must be given explicit instructions.

(2) Based on the study described, the strength and organization of engineer clearing parties, their needs in equipment and supplies, and their missions are carefully planned. A clearing party is usually subdivided into smaller task groups, for example:

(*a*) A leading group to clear antipersonnel mines.

(*b*) A group to breach the obstacles.

(*c*) A group to mark the gap and the routes between gaps in successive obstacles.

(*d*) A group to furnish replacements for casualties or otherwise reinforce the other groups.

f. Training. Thorough training and rehearsal are required before an assault on a fortified area. Training in the techniques of passing obstacles is brought to perfection. Assault groups or teams, composed of infantry, engineer, armor, and artillery elements who must work in close coordination, are formed early in the preparatory phase. These teams rehearse together repeatedly, using terrain and replicas of fortifications as nearly as possible like those they will encounter. Sand tables and like training aids are useful when full-scale reproduction is not feasible.

Section VI. THE DEFENSE

170. Types

a. Defensive operations on the battlefield are characterized by flexibility, dispersion, mobility of the reserves, and the necessity for additional defense localities to be located in greater depth. Tactics employed must be capable of absorbing and containing severe initial shock of enemy attack. Possession of nuclear weapons enables the defender to use the defensive tactics to deceive and destroy the enemy. Opportunities to regain the initiative are numerous; and, in the conduct of the defense, offensive action in conjunction with the use of nuclear weapons is stressed. Defensive operations are conducted aggressively in order to destroy the enemy and to maintain high morale among friendly forces.

b. There are two basic types of defense—mobile defense and area defense.

(1) In mobile defense, minimum forces detect the enemy and canalize him into preselected killing grounds, where the striking force destroys him.

(2) Area defense is a defense based on the retention of specific terrain. The efforts of the defending force are directed toward stopping the enemy at a preselected line of defense.

(3) The primary difference between the two types is in the manner in which the commander deploys his forces and the size and intended use of the reserve. Corps and higher echelons will normally conduct a mobile defense, since this type provides depth, resiliency, and flexibility.

c. Also considered in defensive doctrine are the delaying defense, the withdrawal from action, and the retirement. Any of these may be accomplished before or after either the area or the mobile defense.

(1) *Delaying defense.* In delaying defense, maximum punishment is inflicted on the enemy without friendly forces being decisively engaged. Space is traded for time.

(2) *Withdrawal from action.* In a withdrawal from action,

friendly forces disengage from the enemy in order to initiate some other action.

(3) *Retirement.* In the retirement, friendly forces make a complete break from the enemy and move to a rear area.

171. Employment of Nondivisional Combat Engineer Units

a. Engineer work peculiar to the defensive consists of assisting other troops in the organization of the ground. This is the process of strengthening the position by clearing fields of fire, entrenching, constructing emplacements for weapons and shelters for key installations, and barrier construction, which includes placing wire, minefields, and other obstacles (FM's 5–15, 5–25, and 31–10). Combat troops are, in general, responsible for organization of the ground and construction of defensive works in their assigned areas and sectors. The responsibilities of nondivisional combat engineers are advice and assistance, engineer work, and engineer supply. Engineers furnish plans, supervision, supplies, and assistance as needed for command posts, emplacements, camouflage, and special problems encountered in the area. The precise division of responsibilities is dependent upon the troops, time, equipment, and materials available.

b. Divisional engineers generally need and receive assistance from the battalions of corps combat groups when a defensive position is prepared or when a barrier system is constructed. This may be extended in the same form as in the case of an attack. Included in the tasks which the corps engineer combat groups may take over are roadwork and water supply in the rear areas; emergency installations of standard fixed or floating bridges to replace bridges in the divisional area destroyed by enemy fire or denial operations; earthmoving, using light equipment and dump truck companies; the preparation of obstacles for flank or blocking positions; and the preparation of the barrier system in their assigned area.

c. In the delaying defense, the withdrawal from action, and the retirement, engineer duties also include—

(1) Keeping routes of withdrawal open.
(2) Assisting in the preparation of delaying positions.
(3) Assisting in flank security.
(4) Executing demolitions in front of each successive position.
(5) Participating in denial operations.

d. In the delaying defense, withdrawal, and retirement, corps engineer battalions of the engineer brigade move to the rear immediately in advance of divisional columns. A prime duty is to keep the routes of withdrawal open. These routes are those previously in use, and often they will require only normal mainte-

nance. However, if he is able, the enemy will damage or destroy bridges and other critical points, such as road junctions; and their prompt repair may prove to be a major task. Often, additional routes must be constructed. Corps engineers destroy installations, supplies, and structures which will not be needed by retiring divisional troops. Bridges and culverts along the route of withdrawal are prepared for demolition, and a small party is left at each point to turn them over to divisional engineers, after which each party rejoins its unit. Minefields are laid, and other obstacles are constructed, leaving gaps through them to be closed by divisional engineers when all troops have passed through. Designated delaying positions are prepared with as much clearing of fields of fire and other organization of the ground as time permits. In short, all possible work is accomplished before the arrival of the divisional troops, leaving as little as possible to be done by divisional engineers. The preparation and execution of all demolitions and the creation of all minefields is on order and in accordance with demolition plans of the corps commander (FM 5–25).

e. To support the corps engineers, army nondivisional engineer combat units make road and bridge repairs, prepare and execute demolitions, prepare delaying positions, and lay minefields and construct other obstacles, all having the same relation and following the same principles with respect to corps movement as the work of corps engineers with respect to division movements. Both corps and army nondivisional engineer combat units may be called upon to assist in the movement of corps and army troops and installations.

f. The covering force for a corps defensive position is furnished by corps. In the case of the armored division, it will have organic engineers, but these may be supplemented by elements of the engineer combat group. The latter will be attached to the force since the distance forward of the main battle position is too great for effective control by the group commander. The nondivisional engineer combat element may operate under direction of the engineer of the force staff. The work is done in organizing the position of the covering force is in general of the same character as that in the main position but it is ordinarily less elaborate and refined. A special concern of the covering force and its engineers is that the routes by which it will withdraw through, or to the flanks of, the main battle position must permit its orderly retirement without delay and congestion. The preparation of roads and bridges forward of the division outpost line for supply of the covering force and its eventual withdrawal is the responsibility of the force engineer, and much or all of this work will devolve upon the attached engineer element.

g. Preparation of Rear-Area Defensive Positions.

(1) *Assignments.* Corps and army engineer combat groups may be called upon to prepare defensive positions and barriers in rear areas, to which forward troops may fall back if there is a serious penetration of their positions or if the operation is a delaying defense or a withdrawal. Depending upon the time available, a group may be assigned the preparation of such a position for as much as a division.

(*a*) A fully prepared position requires a great deal of hand labor. The group commander should estimate his requirements and request the assignment of other troops and civilian labor and organize their direction and supervision by his own troops. To the extent that other labor can be employed, elements of the group can concentrate on those tasks which require special equipment and skill.

(*b*) For the preparation of a large defensive position, assignment to battalions of the group should be made on an area basis. Should the position be less extensive, so that a battalion and its assigned extra labor can be profitably employed on the whole, the battalions may be employed in shifts. This arrangement will require close control by group headquarters to see that plans are followed.

(2) *Priority of work.* The group commander must keep in mind that troops may have to occupy the position before it is completely prepared. For this reason, the work which will be most valuable to the occupying troops is undertaken first. The normal priority of work is as given below but it should be understood that, with an adequate assignment of troops, work in two or more of these categories will be simultaneously underway.

(*a*) Constructing positions for artillery and missiles.

(*b*) Clearing fields of fire and objects that restrict observation.

(*c*) Preparing barrier traces by laying minefields and preparing other obstacles, such as roadblocks and bridges, for demolition.

(*d*) Preparing individual shelters and crew-served weapons emplacements (fig. 44).

(*e*) Preparing secondary demolitions and obstacles other than minefields (fig. 45).

(*f*) Improving routes for supply, evacuation, and movement of reserves.

(3) *Layout of position.* The broader features of the position will be prescribed by the corps or army commander. If identity of the troops which will occupy the position is known, their commander is directed to furnish a group

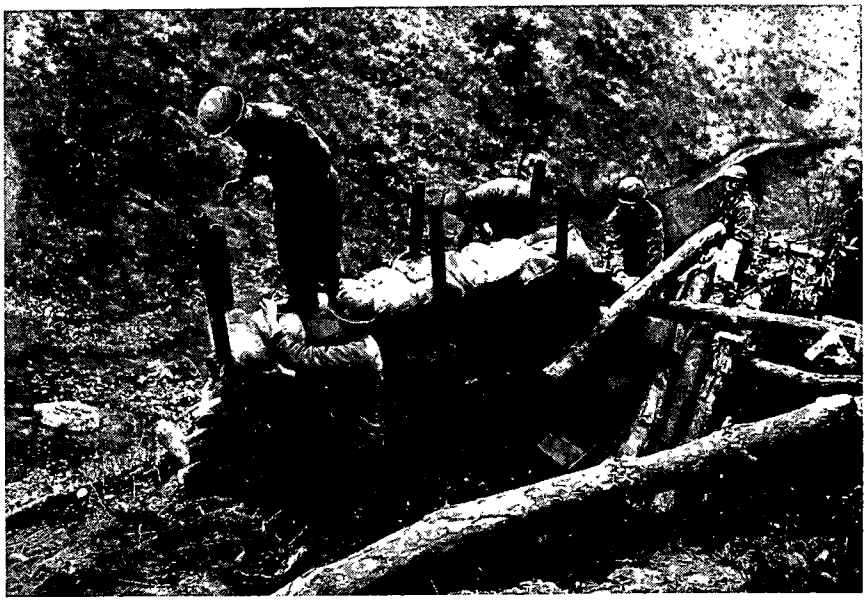

Figure 44. Crew-served weapons emplacement being constructed by engineers.

Figure 45. Abatis created by nondivisional combat engineers.

of infantry and artillery personnel to work in liaison with the engineer combat group, their decisions governing all details of the layout. With these officers, the plans are further developed. During the execution of the work they are assigned to areas and advise the engineer commander in the area of lesser details of their requirements. In some cases, it will not be known what troops will eventually occupy the position. In such cases, infantry and artillery personnel from the corps or army staff or other sources are assigned to assist in the layout of features of the position in a similar manner.

172. Barrier Plan

a. Definition. A barrier system is an interlocking series of natural or artificial obstacles, or both, designed to stop, delay, divert, or canalize the enemy in a designated killing area. To be effective, it must be covered by fire, must be organized in depth, and must have its flanks protected.

b. Purpose. Barriers contribute materially to the accomplishment of both principal purposes of defensive combat—to gain time and to economize forces. One of the fundamentals of defensive combat is a coordinated barrier plan. This is considered in conjunction with other fundamentals and especially the proper utilization of terrain. The natural features of the terrain are supplemented by the effective use of planned barrier systems, including minefields, atomic demolition munitions, chemical contaminants, and other artificial obstacles. The barrier plan includes all antitank obstacles. Field fortifications and barrier systems are employed to improve the natural defense strength of the terrain (FM 31–10). Barriers may be employed in the defense to—

(1) Delay enemy advance toward the front or flanks.
(2) Delay or limit movement of penetrating or enveloping forces.
(3) Canalize enemy movement into areas where he can be defeated, destroyed, or contained.
(4) Separate enemy armor from infantry.
(5) Permit economy of force.

c. The Responsibility and Employment of Nondivisional Engineer Combat Units.

(1) All organizations are responsible for construction of that portion of a barrier within their areas. Engineers support units by technical advice, construction of specified barriers (fig. 46) and execution of certain demolitions.
(2) Engineer units are responsible for the siting and construction of obstacles which—
   (*a*) Require special skills and equipment.

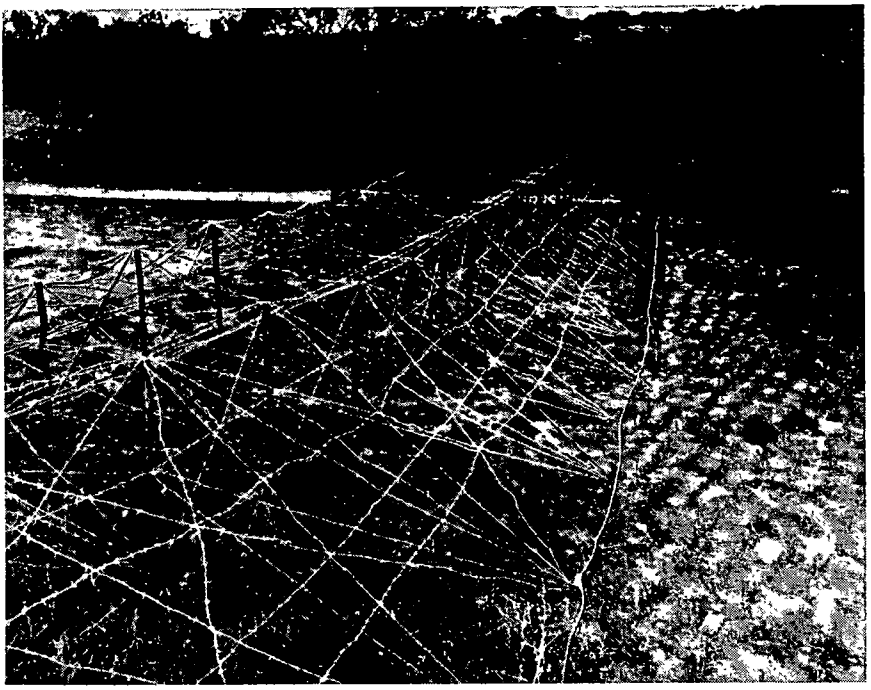

Figure 46. Wire obstacle, part of a barrier.

(*b*) Protect exposed flanks or rear.
(*c*) Benefit the command as a whole.
(*d*) Must be prepared before the arrival of the troops who are to occupy the position.
(*e*) Lie outside the area of responsibility of a particular unit.

(3) The nondivisional combat engineer units must be prepared at all times to accomplish the above-listed responsibilities either in the division or rear areas. In the division area, all work will be coordinated with the division commander or division engineer. Work within the corps and army areas will be supervised by the respective engineer brigade commander in each area.

173. Denial Operations

a. Denial operations deny the enemy the use of material objects and areas of terrain which would otherwise be useful to him. They are accomplished by removal, damage, and total destruction. Damage and destruction are most commonly accomplished by fire, flooding or sinking, mechanical force, explosives, projectiles, and contamination. These operations are not limited to engineers. Other troops can burn supplies and wooden structures, run or drop equipment and supplies into deep water, remove critical

parts from equipment, break up materiel and destroy or damage installations by fire from weapons, and by other means execute denial operations on a large scale. Nondivisional combat engineers use all means but are especially concerned with the more technical aspect of such operations, such as the use of explosives on a large scale or on engineered structures, and the flooding of important areas. Engineers could be called upon for large-scale destruction of supplies in logistical installations during a denial operation. Engineer troops should be familiar with various feasible ways of destroying different types of supplies and equipment, depending upon types, time available, means available, quantity, and location.

b. It is important that the necessity for, and the command control over, denial operations be realized. The extent of denial operations may vary from only minor measures to utter destruction of the area evacuated by the retiring forces. The degree and the details of damage and destruction depend upon plans for counterattack through the area and other tactical and strategic plans and upon political considerations affecting the conduct of the war and postwar adjustments. For these reasons, the proper control of denial operations is a command responsibility. Each commander in the direct chain of command prescribes denial operations in as much detail as possible and delegates to his subordinates general authority under specific directives. Any denial operation is finally executed under specific authority of an officer to whom such authority has been delegated. For more detailed information see FM 5–25 and FM 31–10.

174. Rear-Area Security

a. When the engineer combat group is in a rear area, it will frequently be the only or the largest and best trained organization in the area capable of engaging in infantry type combat. As such, it will often be assigned a rear area security mission requiring the use of troops of other services, and miscellaneous installations, such as hospitals, depots, and shops. Orders to the group commander assigning him this mission will give him the necessary authority to integrate other troops into his defense plan and command authority during any emergency.

b. The extent of the area involved, the composition of the troops within the area, accomplishment of the normal service mission, communication available, and the nature and probability of attack will vary widely; and the number and disposition of troops required on full-time security duty will vary accordingly. The threat may be only minor guerrilla activity or it may be an airborne or night attack in force. The danger of air attack and chemical, biological, or radiological attack will usually be present.

A full-scale defense plan might include an entire engineer combat battalion, army, on outpost duty. Other troops should be incorporated into the defense plan according to their capabilities, each being given a definite mission. Service troops, operating installations in the area, are usually not assigned a defense sector; but, if necessary, they may be given one which can be manned after the alarm is sounded elsewhere. Unless needed on the defense perimeter, they are normally charged only with guarding their own installations and with the last-stand defense thereof. As in all security systems, an alarm and warning system and good communications are important. In a rear area, time usually permits the installation of a system more elaborate than that which would be installed for the protection of a bivouac, and the number of troops on full-time outpost duty may be accordingly reduced. Likewise, the full use of obstacles and mines is justified. Other matters to be considered in the defense plan include—

(1) The composition and command of the reserve.
(2) Provisions for passing individuals and troops through the outpost line, especially at night.
(3) Specific missions or instructions to all troops in the area.
(4) Supply, transportation, evacuation, and other logistical matters.
(5) Protection of important installations.
(6) Command relationships, including establishing a clear chain of command in case of attack.
(7) Handling of native personnel.
(8) Location of command posts.

c. The precautions and countermeasures to be used by an isolated engineer command or unit against enemy airborne attack, guerrilla action, or infiltration must correspond to the nature of the threat. At camps and bivouacs, guards must be posted at all times, including periods of rest and recreation. All-around protection is essential. At night, special precautions are required. The use of improvised alarm devices is valuable. In the case of engineer installations where men are habitually working and valuable property is located, similar precautions are observed. Undue dispersion, either within an installation or in associate installations under common control, increases the danger of enemy action, although there may be a compromise between this aspect and the demand for dispersion against enemy conventional or nuclear air attacks. Working parties, while in route to or from a work or bivouac site, must be constantly on the alert. A party returning to an area or task should be alert for ambushes or boobytraps. In principle, it is desirable that an unfinished construction job be guarded after work hours. In the field, as else-

where, security measures must be kept in balance with the basic mission. Individuals must be trained to habits of alertness and suspicion. They must learn to have their arms always with them and readily available. Individuals, and the command as a whole, must be taught what to do and how to react in the case of enemy airborne attack, guerrilla action, or infiltration.

Section VII. AIRHEAD OPERATIONS

175. Initial Operations

a. During the assault phase of an airborne operation, the most essential duty of the organic airborne division engineer battalion is to clear air landing facilities for assault aircraft. Since, initially, the airborne engineer battalion will be using equipment of limited capability, it may be augmented by elements of the light equipment company, airborne, which can be delivered by parachute or assault type aircraft (fig. 47).

b. In long-duration airborne operations, when landing facilities have been developed so that aircraft can be landed on a continuing basis, the remainder of the engineer light equipment company, airborne, and other engineer combat support elements are airlifted to the airhead.

176. Subsequent Operations

Elements of the airborne division engineer battalion are released from work on the landing facilities as soon as possible, as

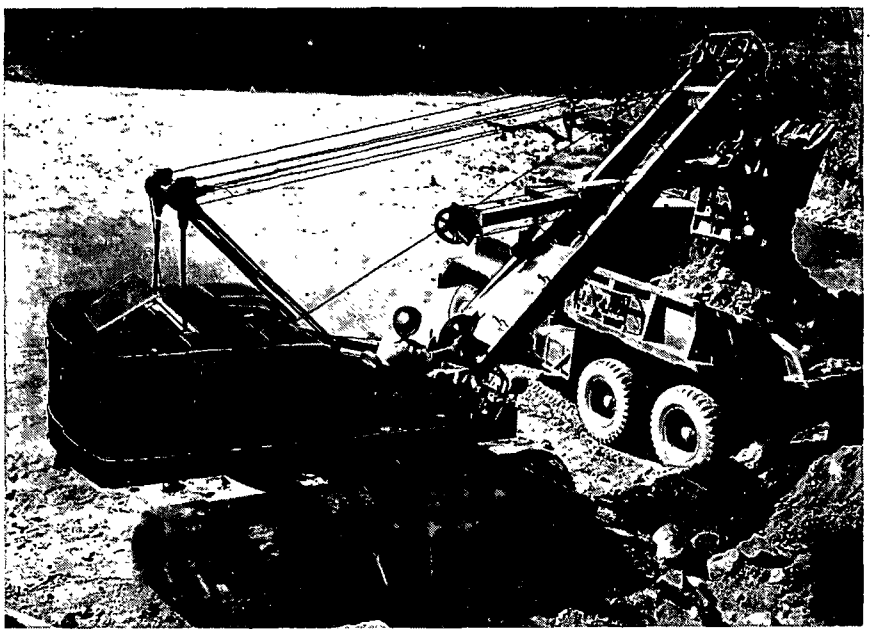

Figure 47. Airborne crane-shovel in operation.

they are relieved by other engineer combat support elements. At an appropriate early time, the engineer combat group will be airlifted to the airhead and will assume control over the construction effort of the landing facilities.

Section VIII. SPECIAL ENVIRONMENTAL FACTORS

177. Types of Areas

Operations in desert areas, frigid areas, mountain regions, jungles, urban areas, and forests make it necessary for the engineer commander to deviate from standard operating techniques. Since each special environmental condition will require special study by the engineer commander and staff sections, no specific instructions are given in this manual for special operations.

178. References

For specific discussions on these special environments, see FM 31–25, desert areas; FM 31–70, frigid areas; FM 31–72, mountain regions; FM 31–30, jungles; and FM 31–50, urban areas.

Section IX. INFANTRY TYPE COMBAT

179. When Committed

a. In addition to fighting in small units to provide security while in bivouac, on the march, or at work, the nondivisional engineer combat units may be committed in an infantry type combat role in an emergency. Such employment involves the abandonment of all or most of their engineer mission and it is ordered by a commander only after the most serious consideration of the effect upon the command as a whole.

b. The basic training of combat engineers parallels that of infantry; but they receive much less tactical training and experience, and their combat capabilities are accordingly reduced. The nondivisional engineer combat unit, as compared with the infantry unit, is still further limited by its lesser strength, a lack of close support weapons, differences in communication facilities, and fewer medical and evacuation personnel. To compensate for its lesser firepower, the engineer unit is assigned a smaller frontage than an infantry unit and appropriate attachments are made, such as mortar support and artillery forward observers.

c. Some of the typical situations where the major force commander may commit an engineer unit to an infantry type combat role are—

(1) An over-extended defensive front.

(2) A sudden enemy penetration or turning movement.

(3) An enemy airdrop, or an organized guerrilla activity, in a rear area.
(4) A need to relieve a combat force that is about to be committed to a more decisive combat role elsewhere.

180. Types of Missions

The type of mission that an engineer unit will receive in an infantry type combat role is limited by the type of unit, its weapons, and personnel. Primarily, there are two types of roles—*offense* and *defense*.

a. Offensive Type Mission. Very seldom do engineer units at corps and army level receive an offensive type mission. A nondivisional engineer combat unit might be given the mission of assisting combat forces in the seizure of a large objective which is vital to the overall operation; or it might be required to destroy an enemy stronghold in the corps or army sector, such as a small bypassed enemy unit. Offensive commitments will be rare, but engineer personnel should be properly trained in the basic infantry battle drill.

b. Defensive Type Mission. Of the two types of missions, the defensive mission is the one most suitable and is the one the engineer units are most capable of performing. After careful consideration of all factors, the major combat force commander may commit the engineer unit. It requires time for the engineer unit to prepare for this type mission. The proper type of support (such as artillery fires) must be coordinated. Nonessential personnel and items of equipment must be moved to an area where they will not be captured or destroyed by the enemy. If there is little or no warning given, the mission is usually a security rather than an infantry type combat mission. It it becomes necessary for the engineer commander to immediately engage the enemy, he should commit his unit in such a way as to stop or slow the enemy advance and then prepare for the infantry type combat role. When ample warning time is available to the engineer commander, he prepares his unit for combat in much the same way as any combat force commander. He makes a tactical estimate of the situation and, after coordinating with adjacent units, and fire support and other supporting units, issues his tactical operations order.

181. Preparation for Combat

a. Adaptability. The entire engineer combat group should not be employed as an organization in infantry type combat, since it has no effective means for the support of its battalions, and once committed the separate companies cannot be re-employed to perform their primary mission until a lengthy process of resupplying of equipment and personnel has been accomplished. The separate

companies are not organized to participate in an infantry type combat role due to the large amount of equipment assigned and the lack of automatic weapons. To be effective in such a role, all equipment should be evacuated to the rear and to accomplish this task, most all personnel within the units would be required. This would leave a small ineffective force to perform the combat mission. On the other hand, its battalions are moderately effective when attached to combat organizations which do have the means for mortar, artillery, and antitank support.

b. Group.

(1) In rare instances, where their services are not otherwise required, the group, less its separate companies, may be assigned a portion of a line where a determined attack, supported by armor, artillery, and heavy weapons, is unlikely. It should, of course, be trained and prepared to resist to its utmost an attack of any proportion. The tactics are basically the same as those of an infantry battle group and its component elements (FM's 7–10 and 7–40). The group should be attached to a division or task force if it is to be employed in an infantry type combat role.

(2) The principal feature of the organization for infantry type combat should be the division of group headquarters and headquarters company into a forward and rear echelon and the rear echelon should include the separate companies, and in addition an equipment pool of all vehicles and equipment, with drivers, including those of the battalion which are not needed in combat or in support further forward. The changes will be greatly facilitated by a group SOP.

c. Battalions.

(1) For employment in the role of infantry type combat, the elements of the battalions are organized to provide command, rifle, and crew-served weapons elements, security of equipment not needed, and personnel for handling special problems of command, communications, and supply. A standing operating procedure (SOP) for this organization should be established and made the basis of training.

(2) The battalion and its elements are divided for infantry type combat into forward and rear echelons.

(*a*) The forward echelon consists of the elements that actually engage in combat and the command, communication, supply personnel and equipment necessary to control them. Light vehicles are included in the forward echelon for communication, ammunition

supply, and the movement of the heavier crew-served weapons.

(*b*) The rear echelon consists of the personnel and equipment not needed, including kitchen trucks, trucks carrying supplies and equipment, and heavy vehicles and powered engineer equipment. The number of personnel assigned is the minimum necessary to maintain the mobility of the rear echelon, provide for its local security, and perform essential administrative functions. The rear echelon is commanded by the senior officer present with it, usually the commanding officer of the headquarters and headquarters company. Its position is in the rear normally beyond the range of light artillery.

(3) The company or platoon, when engaged in an independent mission or when fighting for security, organizes its fighting elements as when fighting with the battalion. Its rear echelon is organized according to the same principles, but its distance behind the line is usually much reduced.

(4) When the battalion is committed to combat, engineer operations are usually suspended. In some situations, however, certain work, such as water supply, reconnaissance, and the emergency repair of roads, may be carried on by personnel of the rear echelon. Occasionally an entire combat company may be held out for the execution of engineer missions.

(5) Because engineer combat battalions vary in degrees of efficiency, it is not practical to establish a detailed plan for infantry type combat which could be followed by all engineer combat battalions, army, under all combat commitments. Each commander, taking into consideration the characteristics of his battalion, should prepare a definite infantry type combat plan as part of the battalion's SOP. Figures 48, 49, 50, and 51 are suggestions which the commander might use as guides in preparing the battalion for an infantry type combat role.

d. Platoons and Squads. A suggested guide for internal changes of a platoon is given below. The forward echelon of the platoon consists of the platoon headquarters (fig. 52) and three combat squads, (fig. 53). The drivers of platoon headquarters and squad vehicles not required by the forward echelon are assigned, with their vehicles, to the company rear echelon.

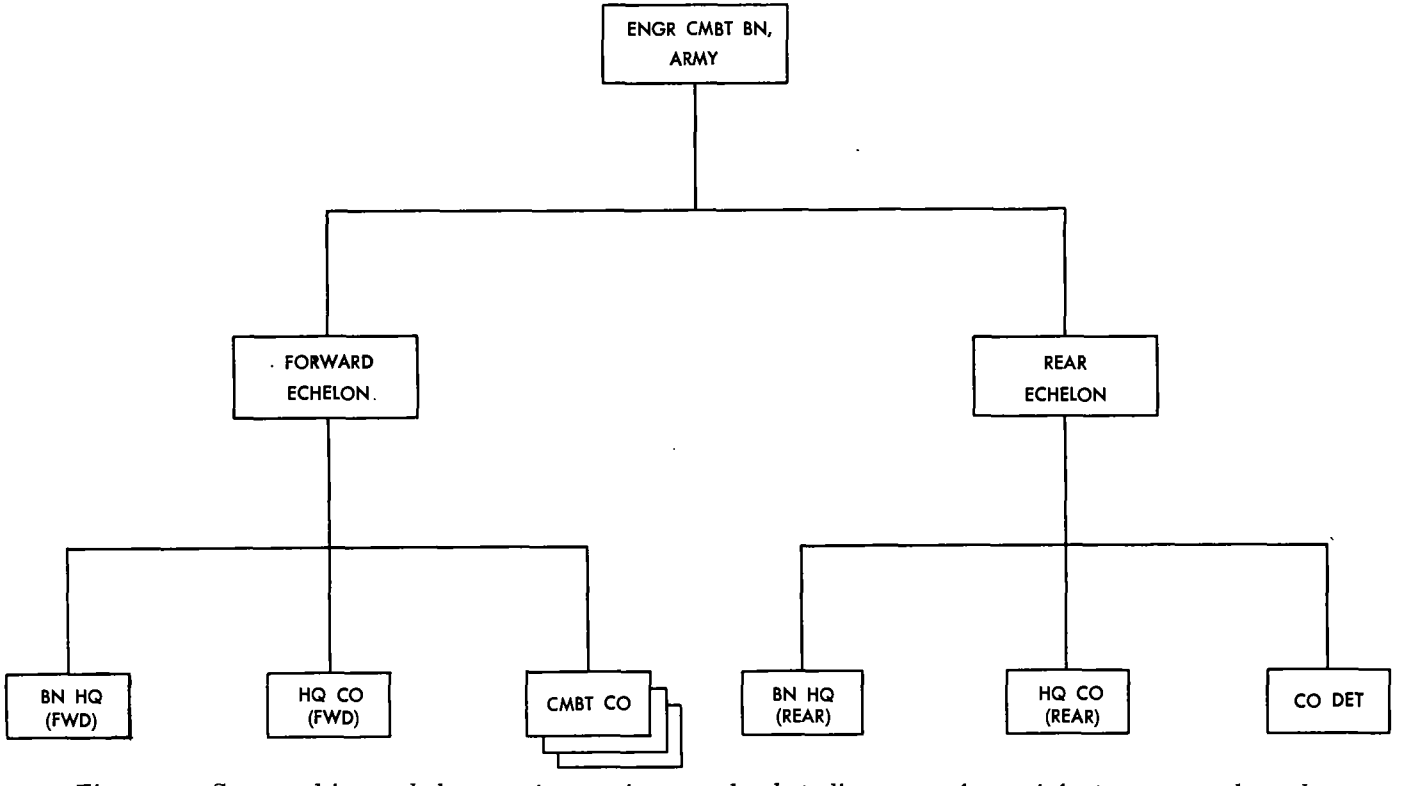

Figure 48. Suggested internal changes of an engineer combat battalion, army, for an infantry type combat role.

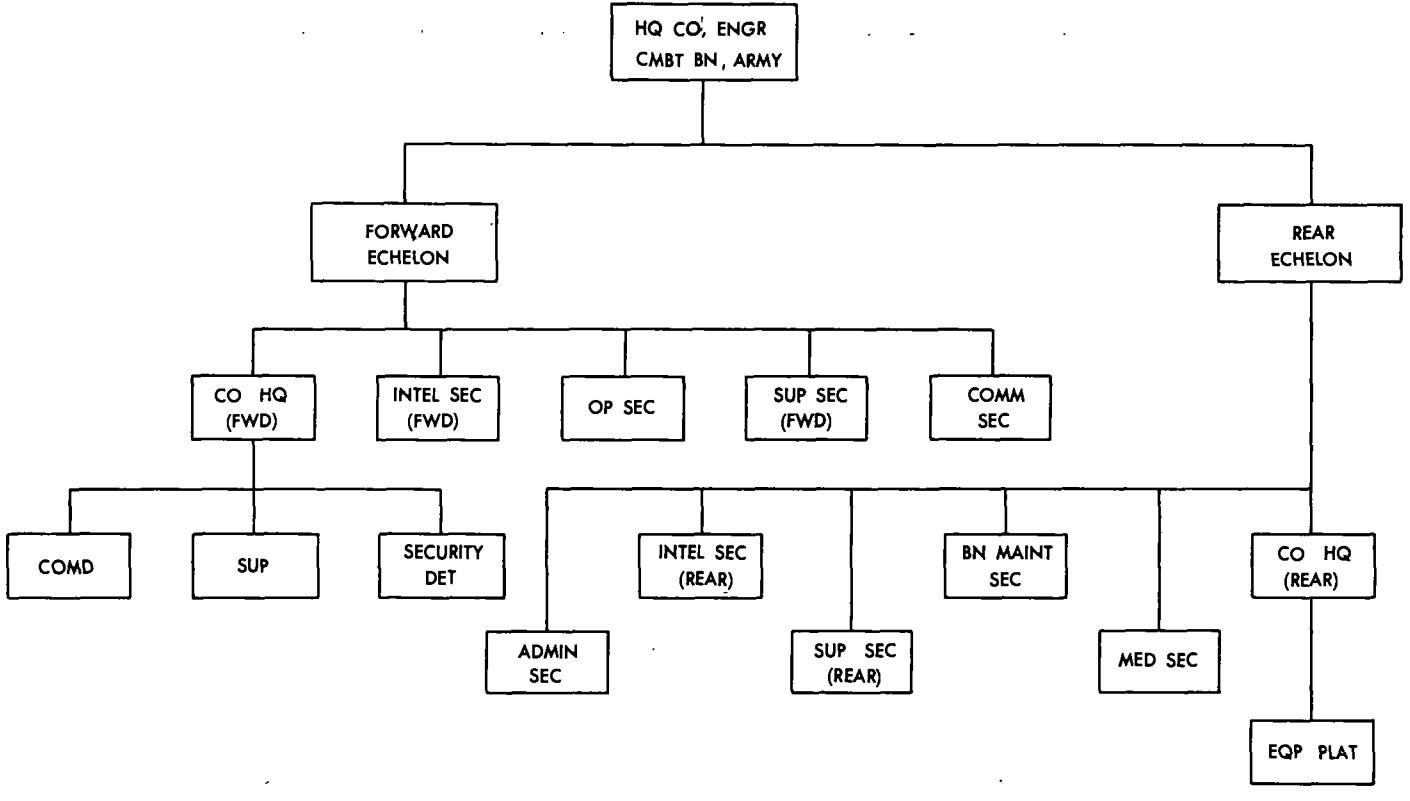

Figure 49. Suggested internal changes of headquarters company, engineer combat battalion, army, for an infantry type combat role.

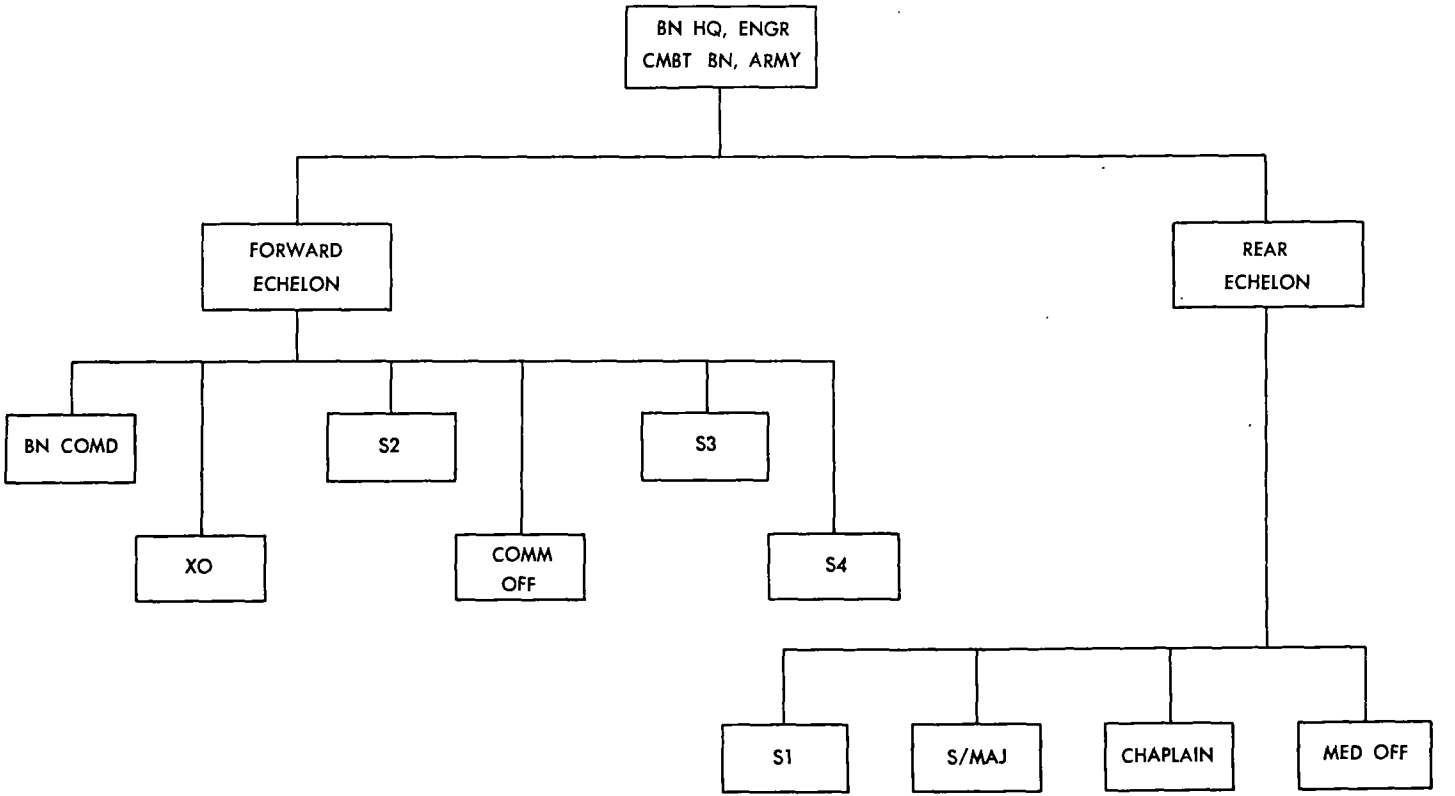

Figure 50. Suggested internal changes of battalion headquarters, engineer combat battalion, army, for an infantry type combat role.

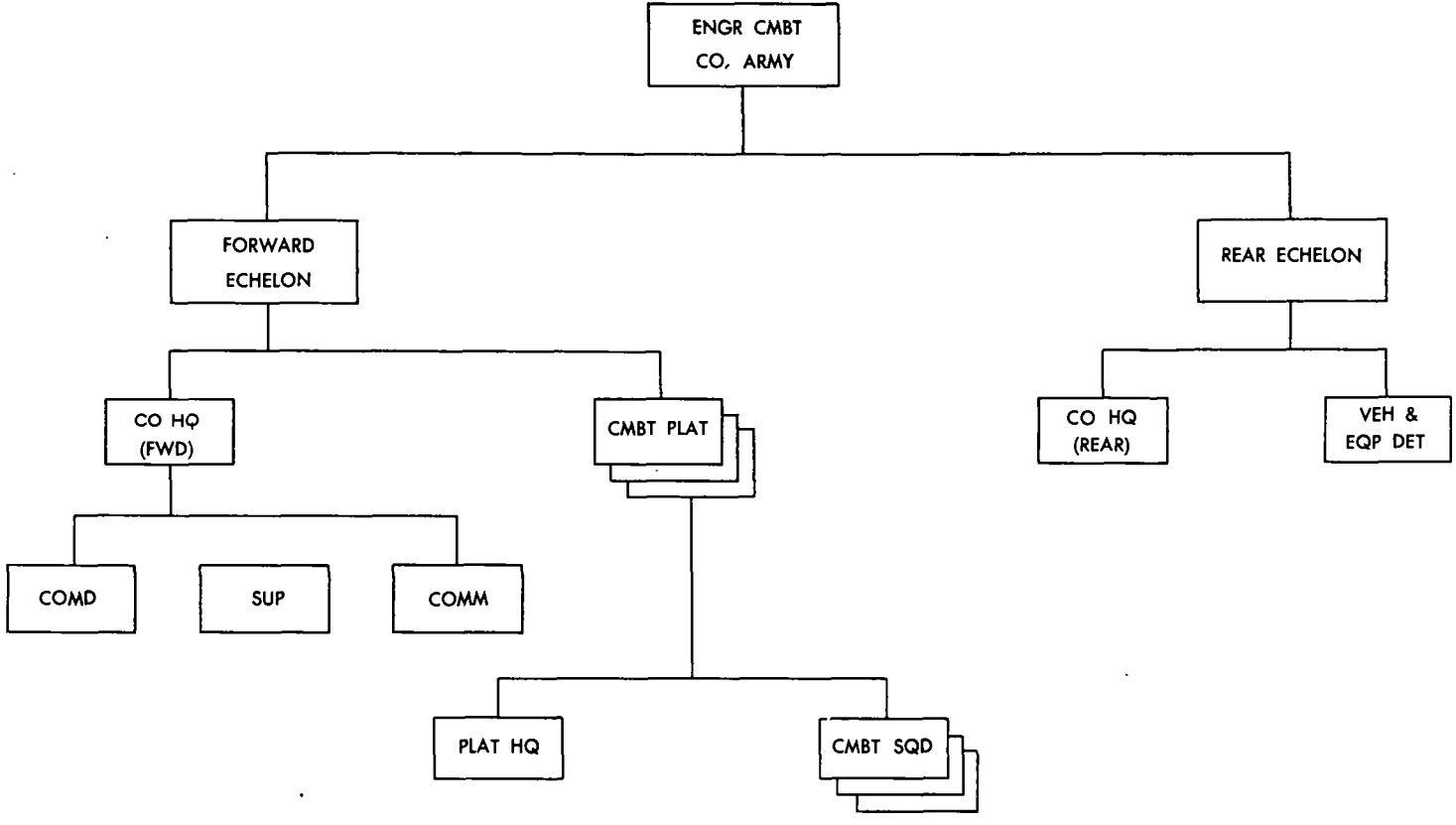

Figure 51. Suggested internal changes of an engineer combat company, army, for an infantry type combat role.

ENGINEER DUTY	WEAPON	COMBAT DUTY
PLAT LDR	RIFLE	PLAT LDR
PLAT SGT	RIFLE	PLAT SGT
RADIO OPR	RIFLE	RADIO OPR
*PION	RIFLE	MESSENGER

*Assigned from the 3rd squad.

Figure 52. Suggested guide for combat duty of platoon headquarters personnel.

ENGINEER DUTY	WEAPON	COMBAT DUTY
SQD LDR	RIFLE	SQD LDR
CMBT CONS SP	RIFLE	RIFLEMAN
CMBT CONS SP	RIFLE	RIFLEMAN
*CMBT CONS SP	LT MG	GUNNER
*CMBT CONS SP	RIFLE	ASST LT MG GUNNER
DML SP	RIFLE	RIFLEMAN
DML SP	ROCKET LAUNCHER	RL GUNNER
PION	RIFLE	ASST RL GUNNER
PION	RIFLE	RIFLEMAN
PION	RIFLE	LT MG AMMO BEARER
ASST SQD LDR	RIFLE	ASST SQD LDR (RIFLEMAN)

*These men will be riflemen in one squad.

Figure 53. Suggested guide for combat duty of squad personnel.

APPENDIX I

REFERENCES

1. DA Pamphlets

DA Pam 20–21	The Army School Catalog.
DA Pam 108–1	Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings.
DA Pamphlets in the 310-series.	Pertaining to administration, training, maintenance, and supply.
DA Pam 750–1	Preventive Maintenance Guide for Commanders.

2. Army Regulations and Special Regulations

AR 25–20	Investigation and Processing of Claims.
AR 220–60	Battalions, Battle Groups, Squadrons; General Provisions.
AR 220–70	Companies; General Provisions.
AR 320–5	Dictionary of United States Army Terms.
AR 320–50	Authorized Abbreviations and Brevity Code.
AR 385–40	Accident Reporting.
AR 385–55	Prevention of Motor Vehicle Accidents.
AR 611–201	Manual of Enlisted Military Occupational Specialties.
AR 611–202	Manual of Enlisted Military Occupational Specialties (Classified) (U).
SR 605–105–5	Commissioned and Warrant Officer Personnel Military Occupational Specialties.
605–105–6	Commissioned and Warrant Officer Personnel Military Occupational Specialties (Classified Series). (U)
AR 700–38	Unsatisfactory Equipment Report.
AR 735–35	Property Accountability—Supply Procedures for TOE Units, Organizations, and Non-TOE Activities.
AR 750–8	Command Maintenance Inspections.

3. Field Manuals

FM 5–1	Engineer Troop Organization and Operations.
FM 5–15	Field Fortifications.
FM 5–20	Camouflage, Basic Principles and Field Camouflage.
FM 5–25	Explosives and Demolitions.

FM 5–26	Employment of Atomic Demolition Munitions (ADM). (U)
FM 5–30	Engineer Intelligence.
FM 5–31	Use and Installation of Boobytraps.
FM 5–34	Engineer Field Data.
FM 5–35	Engineers' Reference and Logistical Data.
FM 5–36	Route Reconnaissance and Classification.
FM 5–132	Infantry Division Engineers.
FM 5–134	Armored Division Engineer Battalion.
FM 5–136	Airborne Division Engineer Battalion.
FM 5–162	Engineer Construction and Construction Support Units.
FM 7–10	Rifle Company, Infantry and Airborne Division Battle Groups.
FM 7–40	Infantry and Airborne Division Battle Groups.
FM 7–100	Infantry Division.
FM 20–32	Land Mine Warfare.
FM 21–5	Military Training.
FM 21–6	Techniques of Military Instruction.
FM 21–26	Map Reading.
FM 21–30	Military Symbols.
FM 24–18	Field Radio Techniques.
FM 24–20	Field Wire Techniques.
FM 30–5	Combat Intelligence.
FM 30–10	Terrain Intelligence.
FM 31–10	Barriers and Denial Operations.
FM 31–15	Operations Against Airborne Attack, Guerrilla Action and Infiltration.
FM 31–21	Guerrilla Warfare and Special Forces Operations.
FM 31–21A	Guerrilla Warfare and Special Forces Operations. (U)
FM 31–25	Desert Operations.
FM 31–50	Combat in Fortified Areas and Towns.
FM 31–60	River-Crossing Operations.
FM 31–70	Basic Cold Weather Manual.
FM 31–71	Northern Operations.
FM 31–72	Mountain Operations.
FM 57–30	Airborne Operations.
FM 31–30	Jungle Operations.
FM 100–5	Field Service Regulations; Operations.
FM 100–10	Field Service Regulations; Administration.
FM 101–5	Staff Officers' Field Manual, Staff Organization and Procedure.

FM 101–10	Staff Officers' Field Manual, Organization, Technical and Logistical Data.

4. Technical Manuals

TM 5–210	Military Floating Bridge Equipment.
TM 5–250	Roads and Airfields.
TM 5–251	Army Airfields and Heliports.
TM 5–252	Use of Road and Airfield Construction Equipment.
TM 5–260	Principles of Bridging.
TM 5–260K	Bridge Model, Training Aid Kit, Timber Trestle, Class 50/80.
TM 5–285	Semipermanent Highway Steel Bridges, 30-, 60-, and 90-foot spans.
TM 5–286	Semipermanent Highway and Railway Trestle Bridges.
TM 5–295	Military Water Supply.
TM 5–302	Construction in the Theater of Operations.
TM 5–374	Light Standard and Standard Unit Steel Trestles.
TM 5–505	Maintenance of Engineer Equipment.
TM 9–2810	Tactical Motor Vehicle Preventive Maintenance, Supply, Inspection, and Training Procedures.
TM 21–300	Driver Selection and Training (Wheeled Vehicles).

5. Technical Bulletins

TB 5–271–1	Bridge, Floating: Raft Section, Light Tactical.

6. Training Circulars

TC 5–2	Employment of Mobile Assault Bridging.

7. Army Training Tests

ATT 5–35–1	Engineer Battalion, Combat, Army.
ATT 5–137 (5–77)	Engineer Company, Panel Bridge.
ATT 5–138 (5–78)	Engineer Company, Float Bridge.
ATT 5–367 (5–54)	Engineer Light Equipment Company.

8. Army Training Programs

ATP 5–5	Engineer Combat Units.

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[AG 353 (1 July 60)]

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For explanation of abbreviations used, see AR 320–50.

☆U.S. GOVERNMENT PRINTING OFFICE: 1961—570521

3000015580

FM 5-142 NONDIVISIONAL ENGINEER COMBAT UNITS—1961